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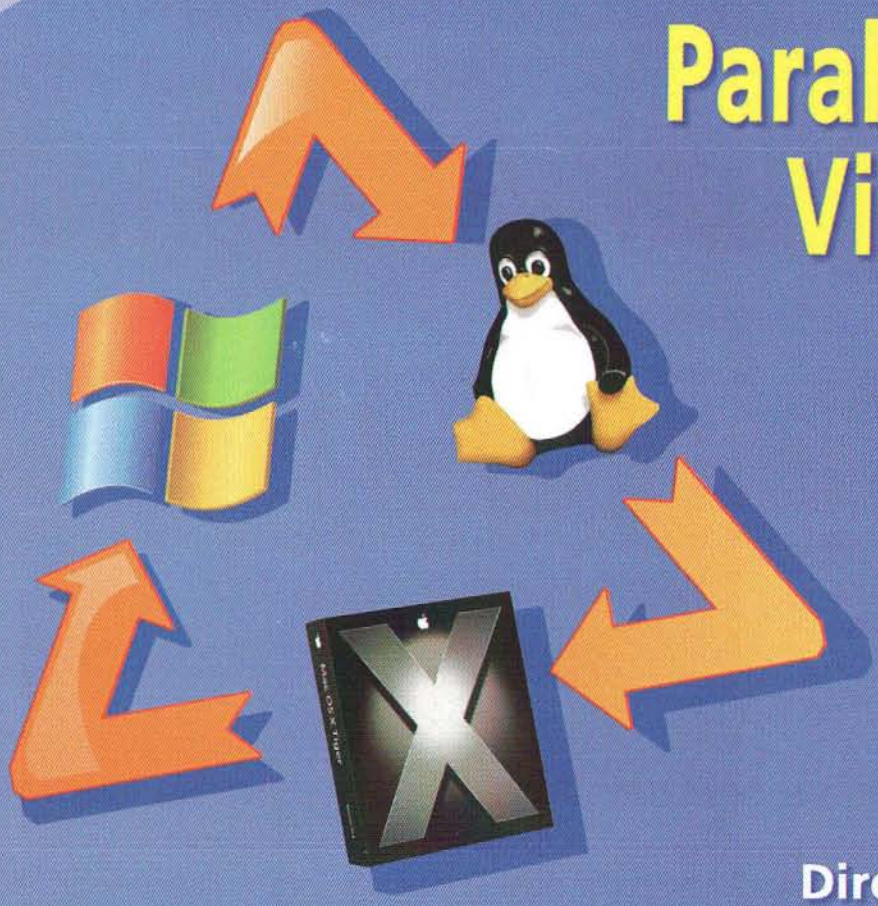

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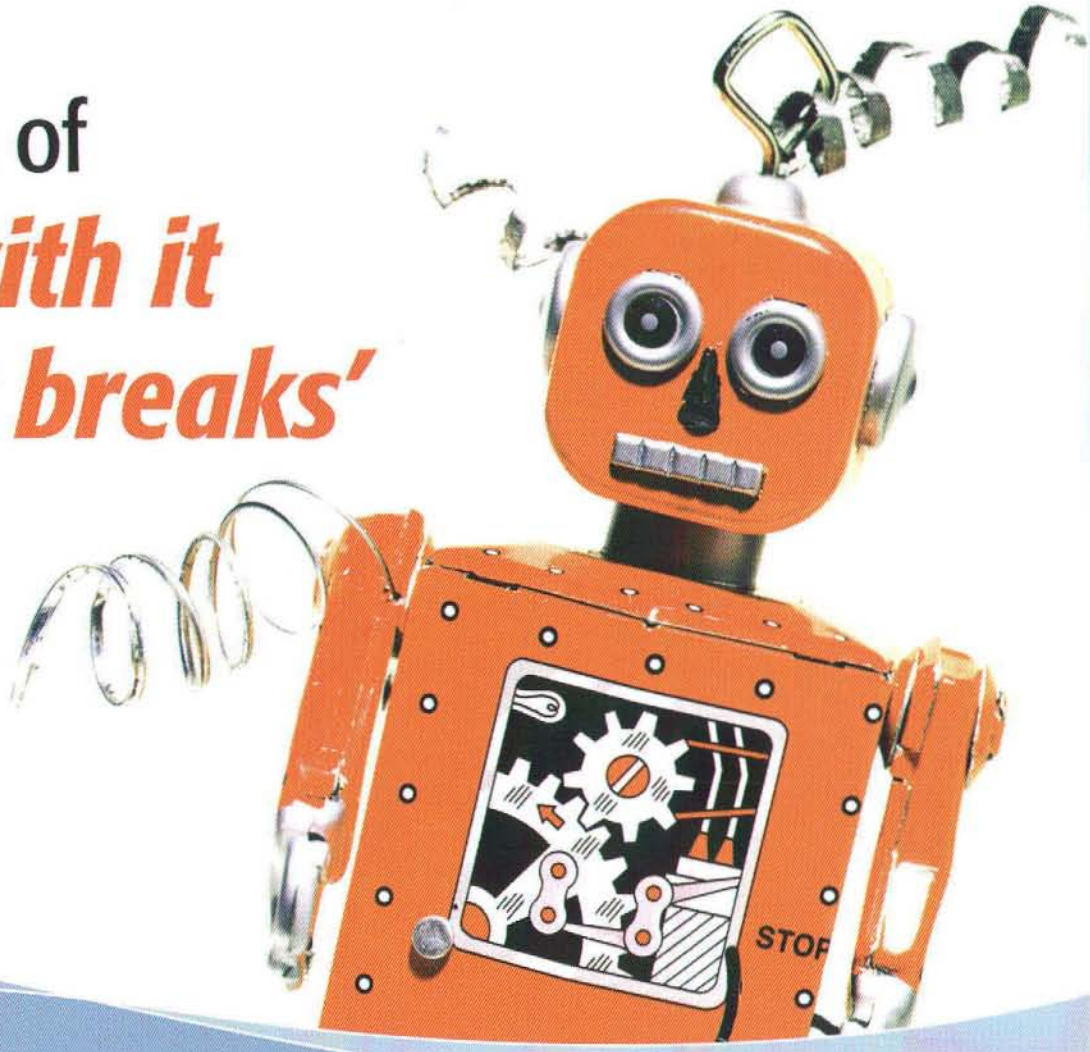

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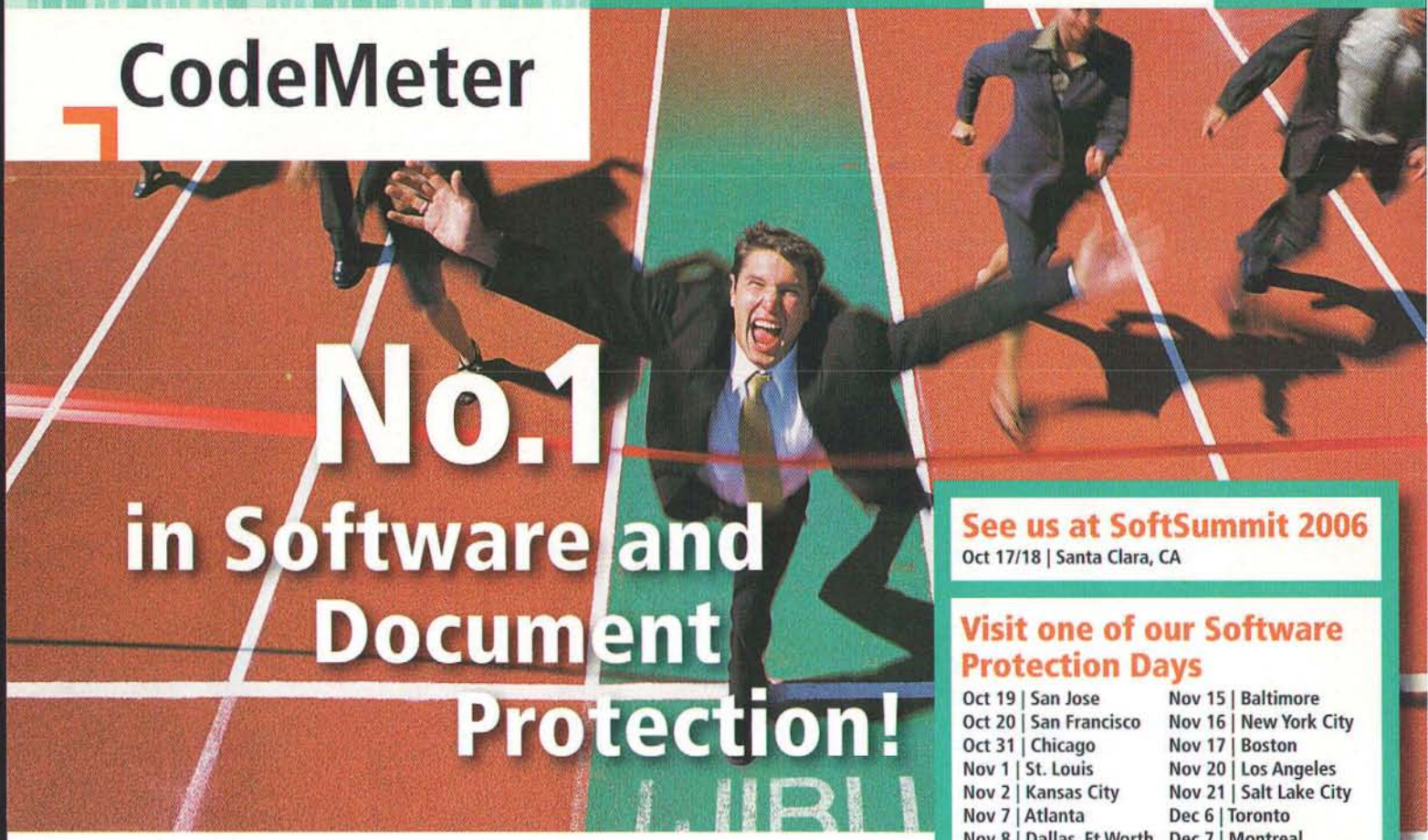

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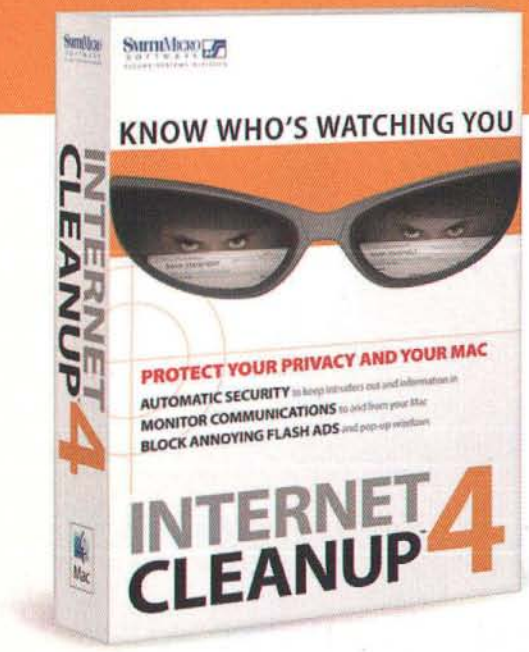

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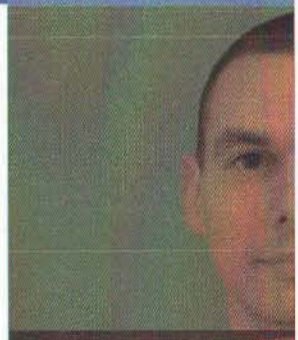


Welcome to November MacTech! The leaves are blowing, American Football is cranking, your MacPro helps to heat the room, and Autumn is in full swing – at least in the North American North! I've been calling this issue our "Windows Issue," but really, it's about so much more.

The top story here is about Parallels, from Mary Norbury. While most people have heard about Parallels, not everyone has had a chance to use it or see it in action. You'll get a first-hand look here, and prepare yourself for when you need to use it. Mary has written for MacTech in the past on topics such as XGrid and Unix scripting.

New MacTech author Criss Myers brings us, "Triple Booting Your Mac." Building on another one of the Intel advantages that has been brought to the Mac, Criss shows you how to stuff Mac OS, Windows and Linux all on the same machine. No virtualization here – they can all run natively!

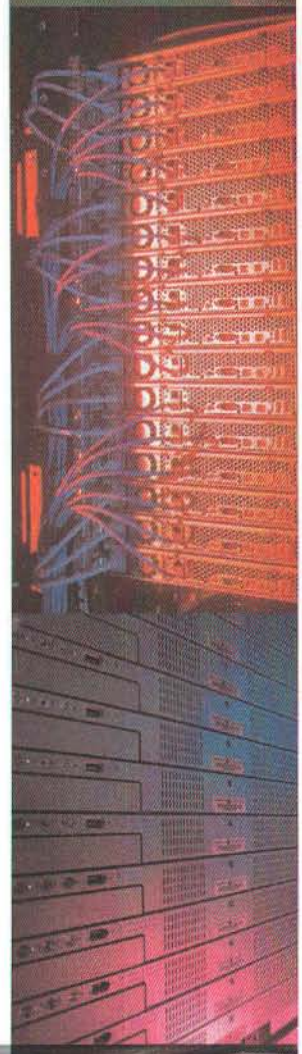
Jose Cruz is back with an article that teaches how to integrate the Subversion version control system right into XCode. Subversion has slowly been taking over the version control space, and will continue to increase its importance in the OS X world. As evidence, check out the new Subversion repositories at the MacOSForge site: <http://www.macosforge.org>.

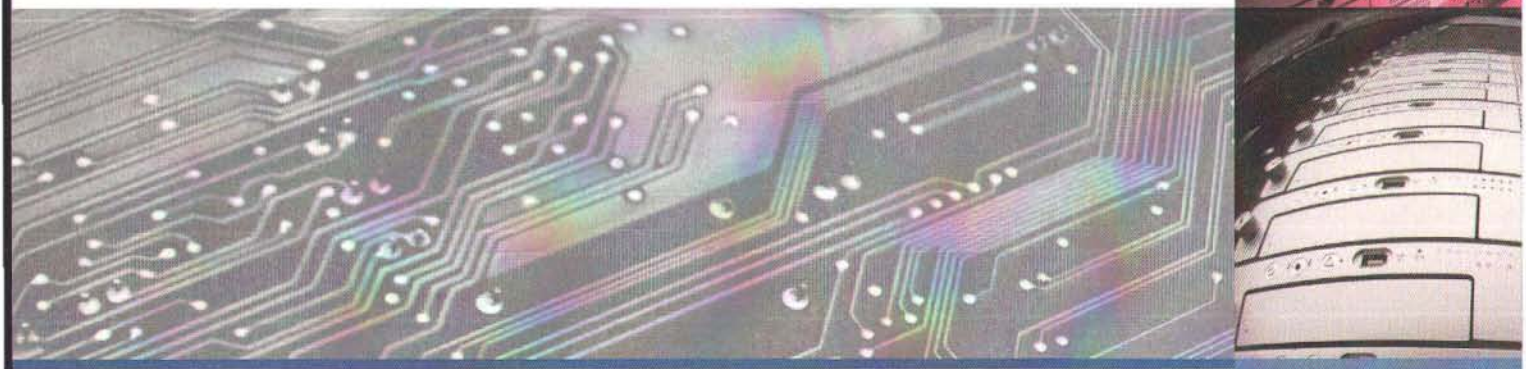
Author Paul Ammann brings us two articles. The first describes a system for graphing spam. Graphing *spam*? Sometimes, visualization makes a huge difference. Let Paul show you how! Secondly, Paul gives us an overview of XSan, Apple's clustered filesystem. This is another technology that not everyone has had a chance to use first-hand, and any familiarity that can be gained beforehand can be useful.

Christopher Roach, who has written for MacTech in the past, introduces GUI apps with Python. Python is an incredibly handy language. Now, you can create Aqua-looking apps for end-users, but keep the programming in Python, if that's your choice.

All of this is in addition to our regular "AppleScript Essentials" and "Mac In the Shell" features. So, no matter the weather, go find your favorite chair, sit and relax with this issue of MacTech. Enjoy!

- Edward Marczak, Executive Editor





by Benjamin S. Waldie

Introduction to Scripting InDesign

In last month's column, we discussed scripting page layout applications in order to automate your desktop publishing workflow. Specifically, we focused on getting started with scripting QuarkXPress <http://www.quark.com>. This month, we will be discussing another popular and well-known page layout application, Adobe InDesign <http://www.adobe.com/products/indesign/>.

Getting Started

Before we begin scripting InDesign, I'd like to briefly discuss InDesign's AppleScript support. When you open InDesign's dictionary for the first time, one of the things you may notice is that it is quite long. See figure 1.

InDesign contains extensive AppleScript support for automating *almost* anything that you can do manually. Sure, you may come across a feature here and there that doesn't have corresponding AppleScript support. However, these situations are certainly few and far between. Furthermore, InDesign's AppleScript support is constantly being revised, improved, and expanded with each new release of the application, so it just keeps on getting better.

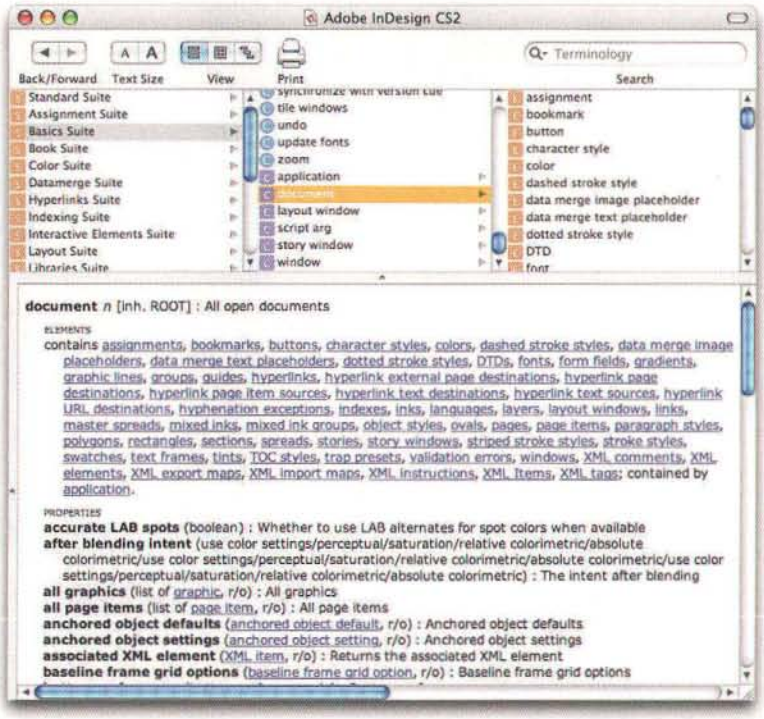


Figure 1. InDesign's AppleScript Dictionary

Working with Documents

Within InDesign, you will most likely want to automate tasks that involve documents, so that is what we will focus on here. If you need to automate books, you are encouraged to explore InDesign's dictionary for the functionality you require.

Referring to Documents

A document is referenced using the `document` class, which can be found in the ***Basics Suite***, in InDesign's dictionary. Documents may be referenced using their index (front to back positioning) or by their name. The following example code demonstrates how a document would be referenced using its index.

```
tell application "Adobe InDesign CS2"
  tell document 1
    -- Do something
  end tell
end tell
```

Similarly, the following code would reference a document by its name.

```
tell application "Adobe InDesign CS2"
 tell document "My Document.indd"
   -- Do something
 end tell
end tell
```

In most cases, unless you will always only have one document opened in InDesign, it is usually the safest to refer to a document by its name. This way, if the front to back positioning of a document changes, your script will continue to target the correct document.

Throughout this month's column, however, we will be referring to documents by their index. Specifically, we will reference `document 1`, which will refer to the frontmost document. Another way to target the frontmost document is to reference the active document property of the application class. For example:

```
tell application "Adobe InDesign CS2"
  tell active document
    -- Do something
```

```
  end tell
end tell
```

Checking for the Existence of a Document

Before your AppleScript begins interacting with a document, it is often a good idea to make sure that the document exists. This may be done using the `exists` command, as follows.

```
tell application "Adobe InDesign CS2"
  document 1 exists
end tell
-> true
```

As the example code above demonstrates, the result of the `exists` command is a `true` or `false` Boolean value indicating whether or not the document exists.

Creating Documents

Depending on your workflow, you may not need to work within an existing document, but within a new document. To create a new document via AppleScript, use the `make` command, as demonstrated below.

```
tell application "Adobe InDesign CS2"
  make new document
end tell
-> document "Untitled-1" of application "Adobe InDesign CS2"
```

The result of the `make` command is a reference to the newly created document, which may be placed in a variable and referenced later in order to perform additional tasks within the document.

Please note that in the example code above, we did not specify the size of the document to be created. In this situation, the document would be created using InDesign's default document size. To specify a size for the document, you may optionally specify values for the `page width` and `page height` properties, which are actually properties of the `document preferences` property of the `document` class. Here is an example of how this would be done:

```
tell application "Adobe InDesign CS2"
  make new document with properties {document
preferences:{page width:8.5, page height:11}}
end tell
-> document "Untitled-1" of application "Adobe InDesign CS2"
```

Again, make note of the example code above. Here, although we have specified a size for the document, we have not specified unit of measurement, i.e. inches, points, centimeters, millimeters, etc. Because of this, the default unit of measurement will be used when creating the document. In other words, if InDesign's default unit of measurement is set to inches, then an 8.5" x 11" document would be created.

You may optionally choose to specify the unit of measurement when creating the document, as demonstrated below.

```
tell application "Adobe InDesign CS2"
  make new document with properties {document
preferences:{page width:"8.5in", page height:"11in"}}
end tell
-> document "Untitled-1" of application "Adobe InDesign CS2"
```

Another way to ensure that the proper unit of measurement will be used when the document is created is to modify the default unit of measurement. This is done by setting the value of the `horizontal measurement units` and `vertical measurement units` properties of the document's `view preferences` to the desired unit type. For example, the following sample code will set the default unit of measurement to inches, and then create the document, ensuring an 8.5" x 11" document.

```
tell application "Adobe InDesign CS2"
  tell view preferences
    set horizontal measurement units to inches
    set vertical measurement units to inches
  end tell
  make new document with properties {document
preferences:{page width:8.5, page height:11}}
end tell
-> document "Untitled-1" of application "Adobe InDesign CS2"
```

Since InDesign's default unit of measurement may vary from user to user, changing the default unit of measurement to the desired value at the beginning of an InDesign-specific AppleScript is usually good practice. In addition to ensuring that a newly created document will be the correct size, specifying the default unit of measurement at the beginning of your script will help to ensure that resizing or creating other elements, such as text frames, rectangles, etc., will be done using the desired unit of measurement.

Working with Text

Developers that are automating InDesign will often have the need to interact with text frames in InDesign documents, whether that need is to insert text, extract text, format text, or more. We will now discuss a number of ways to interact with text frames in InDesign.

Creating a Text Frame

First and foremost is creating new text frames. This will be necessary if you intend to add text to a newly created document.

Before creating a text frame, the first thing you will want to do is identify where the text frame will be created, and how large it will be. Once you have determined this information, you will need to translate it into a list of bounds, which can be specified via AppleScript when the text frame is created. Bounds of a text frame will be specified as a list of four items, formatted as follows:

```
{top position, left position, bottom position, right
position}
```

Once you have determined the desired bounds for a text frame, use the `make` command to create the text frame. In doing so, specify the bounds for the text frame using the `geometric bounds` property of the text frame, as demonstrated below.

```
tell application "Adobe InDesign CS2"
  tell page 1 of document 1
    make new text frame with properties {geometric
bounds:{1, 1, 3, 6}}
  end tell
end tell
-> text field id 191 of page id 159 of spread id 154 of
document "Untitled-1" of application "Adobe InDesign CS2"
```

Assuming that the default unit of measurement is set to inches, the code above would create a 5" x 2" text frame

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that is 1" down and 1" across on the first of page of the frontmost document.

Placing Text

Now that you have a text frame, you are ready to insert text into it. To insert text into a text frame, replacing any existing content, set the `contents` property of the text frame's `parent story` to the desired text.

```
tell application "Adobe InDesign CS2"
  tell parent story of text frame 1 of page 1 of document 1
    set contents to "My Project Text"
  end tell
end tell
```

It is also possible to insert text into a specific location within a text frame, appending it to existing text. This is done by setting the contents property of a specified `insertion point` within the parent story of the text frame to a specified value. For example, the following code would append the text "My Project Text" to the end of any existing text within the specified text frame, without replacing the existing text.

```
tell application "Adobe InDesign CS2"
  tell parent story of text frame 1 of page 1 of document 1
    set contents of insertion point -1 to "My Project Text"
  end tell
end tell
```

Styling Text

Text in InDesign possesses numerous properties, including font, point size, color, and much more, which are accessible via AppleScript. The following example code demonstrates one way that these properties could be modified. This particular code will set the font of the text within the specified text frame to "Arial", the point size of the second word to 24, and the color of the first three words to specified values.

```
tell application "Adobe InDesign CS2"
  tell parent story of text frame 1 of page 1 of document 1
    set applied font to "Arial"
    set point size of word 2 to 24
    set fill color of word 1 to "C=0 M=0 Y=100 K=0"
    set fill color of word 2 to "C=100 M=0 Y=0 K=0"
    set fill color of word 3 to "C=0 M=100 Y=0 K=0"
  end tell
end tell
```

Please note that, in the above example, the colors specified correspond to the names of colors in InDesign's *Swatches* palette. See figure 2.

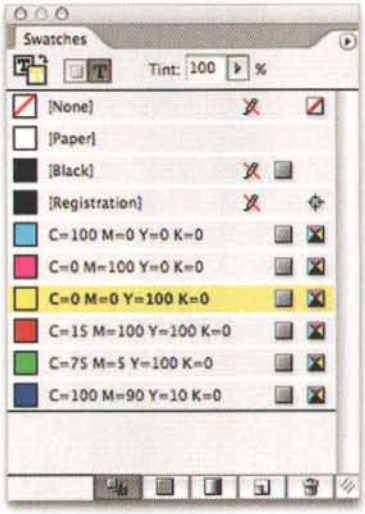

Figure 2. InDesign's Color Swatches Palette

Figure 3 shows the result of executing the previous code on a text frame that contains the text "My Project Text".

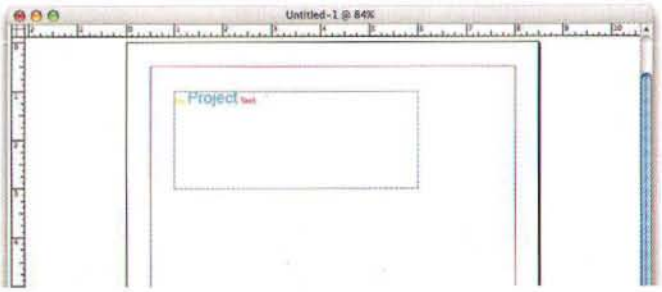

Figure 3. Styled Text in InDesign

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Working with Graphics

Interaction with graphics is often another important aspect of scripting InDesign. In InDesign, graphics are typically placed within rectangles. However, it is also possible to place them into text frames. For the sake of reducing confusion, in this column, we will discuss working with graphics in rectangles.

Creating a Graphic Frame

Like text frames, rectangles may be created via AppleScript by using the `make` command, and specifying the desired bounds for the rectangle. For example, assuming the default unit of measurement is set to inches, the following code would create a 3" x 5" rectangle 1" across and 3" down.

```
tell application "Adobe InDesign CS2"
  tell page 1 of document 1
    make new rectangle with properties {geometric bounds:{3,
1, 6, 6}}
  end tell
end tell
-> rectangle id 385 of page id 159 of spread id 154 of
document "Untitled-1" of application "Adobe InDesign CS2"
```

Again, here, the result of the `make` command is a reference to the newly created rectangle.

Placing a Graphic

Once a rectangle exists, the `place` command may be used to place a graphic within the rectangle. The `place` command requires a reference to the graphic file to be placed. For example:

```
set theImage to choose file with prompt "Please select an
image to place:" without invisibles
tell application "Adobe InDesign CS2"
  tell rectangle 1 of page 1 of document 1
    place theImage
  end tell
end tell
-> image id 391 of rectangle id 385 of page id 159 of spread
id 154 of document "Untitled-1" of application "Adobe
InDesign CS2"
```

Here, the result of the `place` command is a reference to the newly placed image, within the rectangle. Figure 4 shows an example of a placed graphic within a rectangle on an InDesign document page.

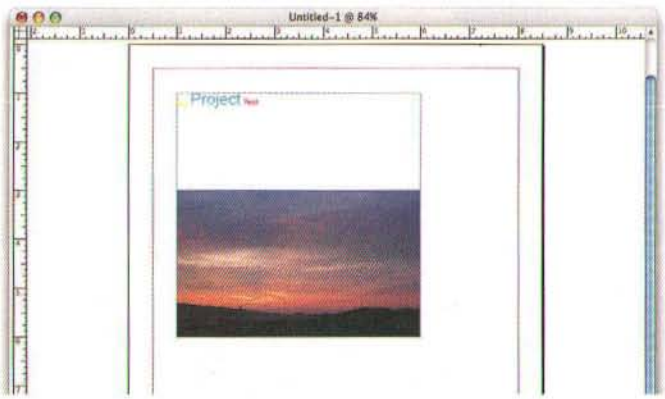

Figure 4. A Placed Graphic

Labeling Page Items

Throughout this column, we have referenced text frames and rectangles by index. When we discussed referencing documents, I mentioned that a more accurate way of referring to documents was by name. The same rule applies to text frames, rectangles, and other page items within InDesign documents. The reason for this is that, if a new page item is created, or page items are repositioned within the document, the index of a page item may change.

To always ensure that your script is referencing the correct page item, you may apply a script label to the item. This may be done via AppleScript, for example:

```
tell application "Adobe InDesign CS2"
  tell text frame 1 of page 1 of document 1
    set label to "myTextFrame"
  end tell
end tell
```

Applying script labels to page items may also be done manually within InDesign by using the ***Script Label*** palette, which can be made visible via the ***Window > Automation*** menu. See figure 5.

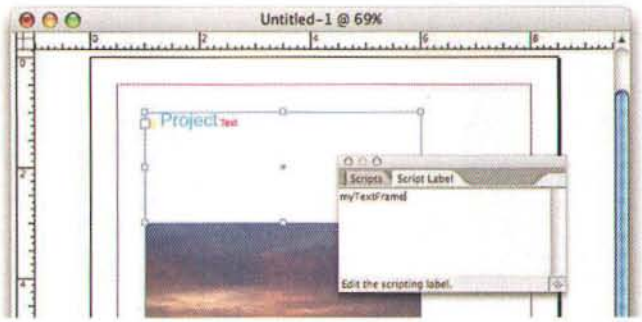

Figure 5. InDesign's Script Label Palette

Once a script label has been applied to a page item, you may reference it by that label, rather than by its index. For example:

```
tell application "Adobe InDesign CS2"
  tell text frame "myTextFrame" of page 1 of document 1
    -- Do something
  end tell
end tell
```

Next Steps and Resources

Documentation and Support

If you plan to continue scripting InDesign in order to automate processes in your own workflow, there are a number of resources available to you for continued learning.

First and foremost, Adobe provides detailed documentation for scripting InDesign. A very comprehensive ***InDesign Scripting Reference*** and ***InDesign Scripting Guide***

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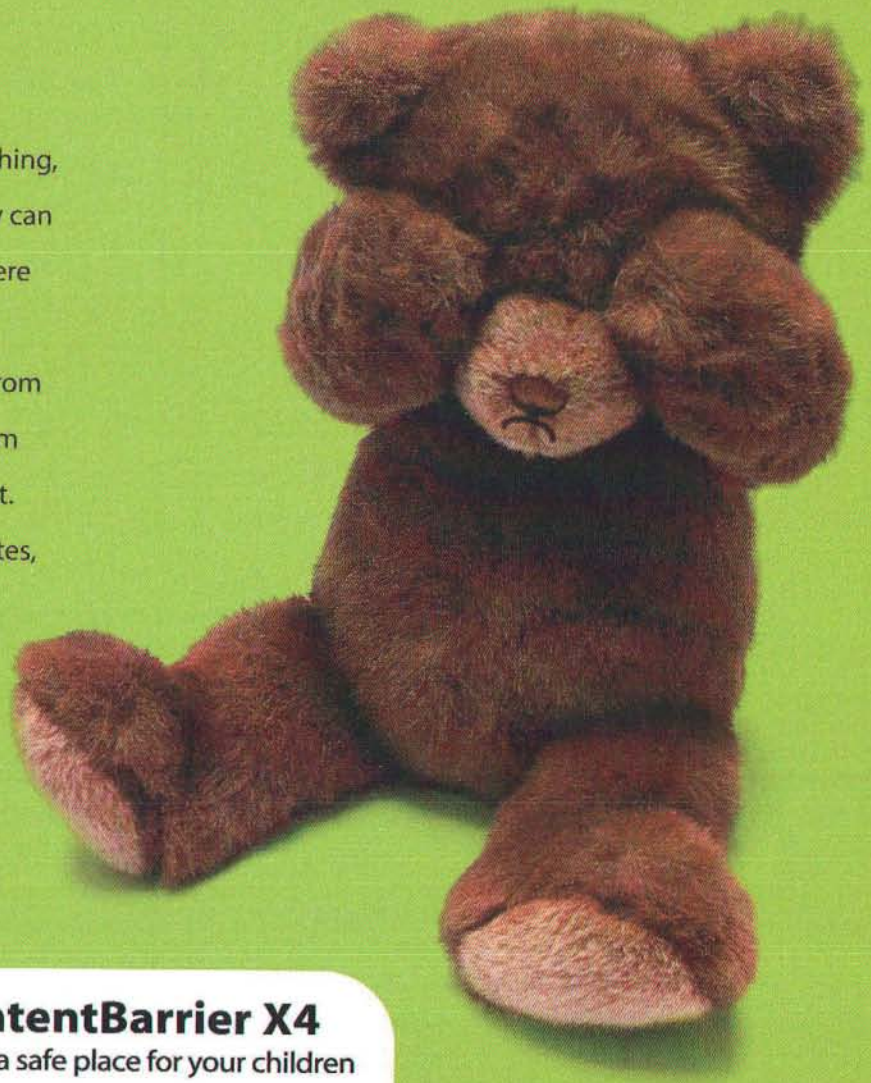

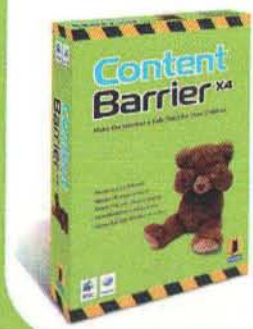

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may be downloaded from the Adobe website at <http://www.adobe.com/products/indesign/scripting.html>. These documents contain extensive documentation with regard to all of InDesign's scripting features, and will no doubt prove to be an important addition to any InDesign scripter's arsenal.

The online Adobe support forums at <http://www.adobe.com/support/forums/> are a tremendous resource for anyone using or scripting InDesign, or any other Adobe application for that matter. Here, you will find numerous application-specific forums, including the *InDesign Scripting* forum, where you may post your questions to other InDesign scripters.

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In Closing

For those desktop publishers currently using InDesign and looking to become more efficient, hopefully, this month's column has helped to shed some light on the possibilities. Be sure to continue exploring InDesign's AppleScript support on your own, and don't forget to check out the resources that I have mentioned above.

Until next time, keep scripting!

MT

About The Author

Ben Waldie is the author of the best selling books "AppleScripting the Finder" and the "Mac OS X Technology Guide to Automator", available from http://www.spiderworks.com, as well as an AppleScript Training CD, available from http://www.vtc.com. Ben is also president of Automated Workflows, LLC, a company specializing in AppleScript and workflow automation consulting. For years, Ben has developed professional AppleScript-based solutions for businesses including Adobe, Apple, NASA, PC World, and TV Guide. For more information about Ben, please visit http://www.automatedworkflows.com, or email Ben at ben@automatedworkflows.com.

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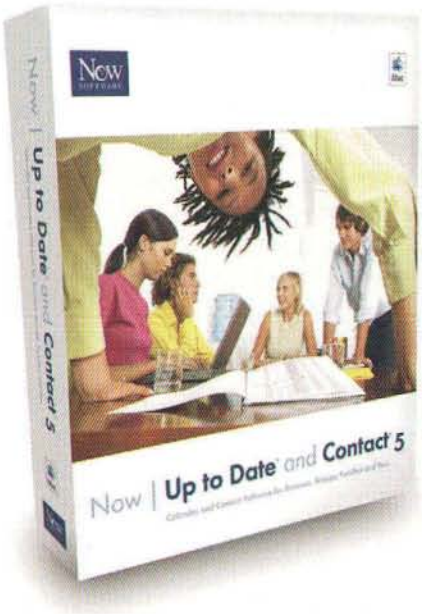

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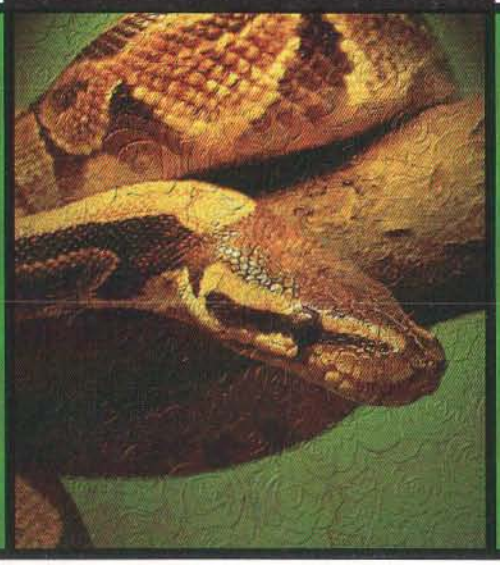


Python Power Tools

An Introduction to Some Tools Available for Python Developers Running OS X

By Christopher Roach

Introduction

One thing that every craftsman loves are new tools, and programmers are no exception to this rule. If you fall into the category of a Python developer, then this article was written precisely for you. What I propose to do during the course of this article is to introduce you, the Python programmer, to a few libraries that will aid you in your development ritual and perhaps even inspire you to develop in new and interesting areas.

One thing you'll no doubt notice once we start our exploration into the tools available for Python developers, is that there is no limit to the number of libraries, packages, modules, etc. that you can use to get your job done. What I've tried to do here in this article is concentrate on the most popular and most stable, and then perhaps point out a couple of alternatives for those of you not content with using just the mainstream tools.

So, with our goal clear in our minds, let's press on, and begin our journey with a look at some of the GUI libraries available for Python on OS X.

GUI Libraries

GUI libraries are an area that in no way, contradict the observation I made in the introduction. There is a plethora of GUI libraries available to Python programmers, and many of these are open source and cross-platform so they can easily be used on the Macintosh OS, as well as many of the other operating systems that you may be forced to use outside of your own little world. A few of these libraries are Tkinter (the standard Python interface to the Tk GUI toolkit), wxPython (a Python wrapper for wxWidgets, a popular cross-platform GUI library written in C++), PyQt (a set of Python bindings for the Qt toolkit that is also cross-platform), and many more. I'll concentrate on two of the most popular libraries in the next two subsections of this article starting with Tkinter, and then I'll mention a few alternatives quickly in the final section.

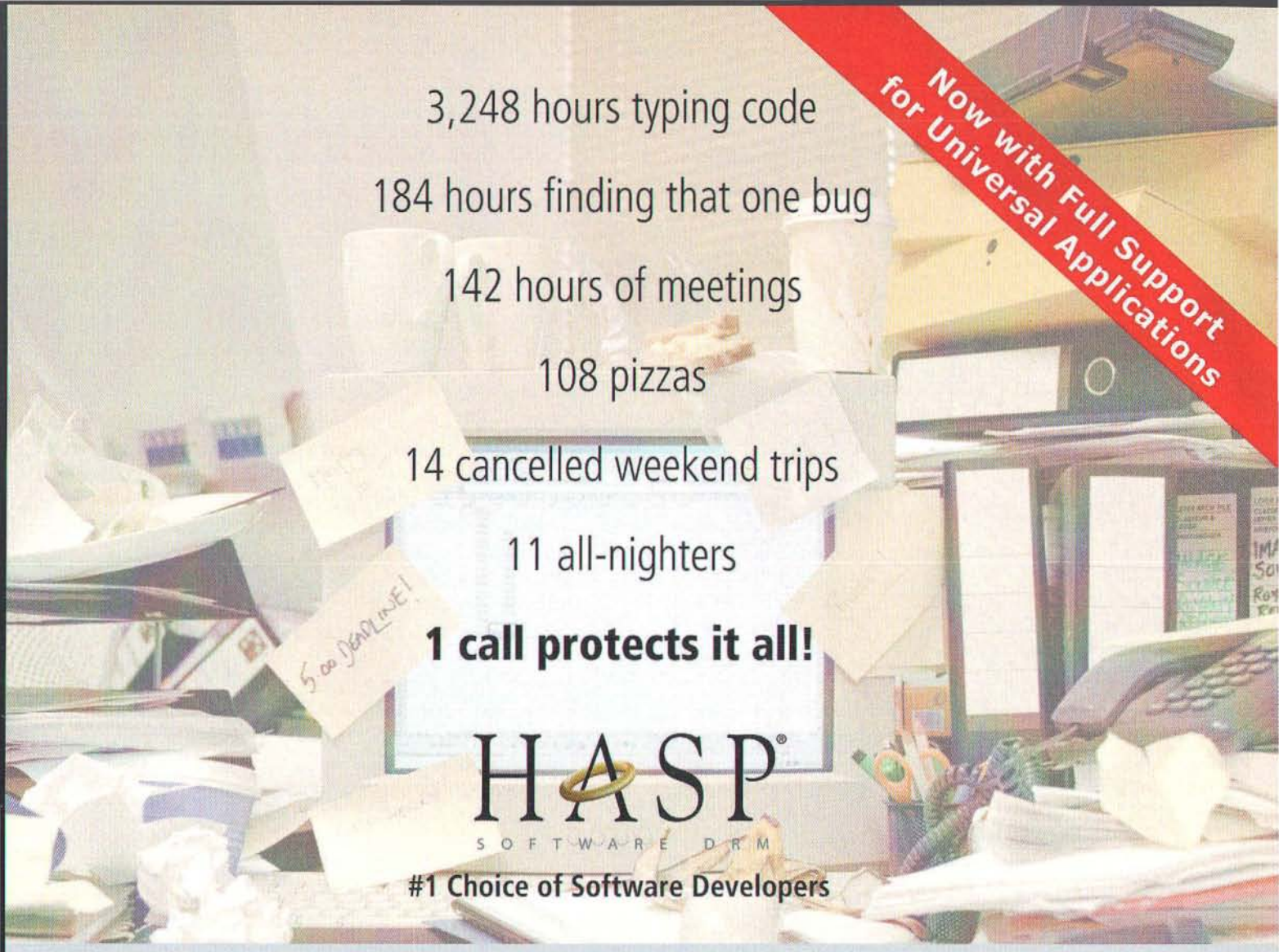
Tkinter

As I stated in the previous paragraph, Tkinter is the standard interface to the Tk GUI toolkit for Python programmers. It is also pretty much the de facto standard for GUI development with Python on any platform. There are many advantages to using Tkinter as your GUI library of choice, when developing Python-based applications.

First, it's one of the most portable GUI libraries. Tcl and Tk have been around for such a long time, and have developed such a devoted following, that it is nearly impossible to name a platform that doesn't have a port of the toolkit available. Second, it's really easy to install on the Macintosh operating system; simplyinstall MacPython on your system, rather than going with the default version of Python. Finally, it's extremely easy to develop GUI-based applications with it. This is, of course, one of the reasons why Tk has such a large following amongst programmers. So, with all of these great benefits in mind, how do we get Tkinter installed?

Well, if you installed the MacPython binary—and I recommend that you do <http://homepages.cwi.nl/~jack/macpython/download.html>—you're already halfway there. Basically, you have Python and the Tkinter interface already, now all you need to do is get a copy of the Tk toolkit. To do this you'll need to download and install the latest distribution of the Tcl/Tk Aqua binary from <http://tcltkaqua.sourceforge.net> I installed the Batteries Included binary (~30MB), but you can probably get away with just installing the 5MB version, but really, why not install the whole thing and give yourself some more toys to play with later? You can always learn Tcl/Tk after toying around with your new Python libraries; after all you can never know too many programming languages.

Once you've got a version of Tk installed on your computer, the only thing left to do is enable the Tkinter binary module using the MacPython PackageManager application. To do this, find the MacPython folder on your



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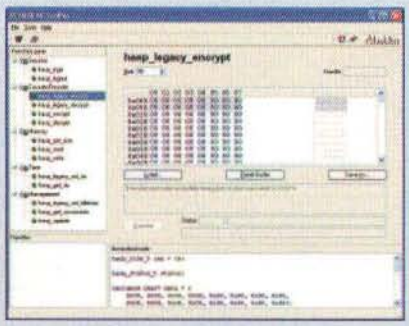

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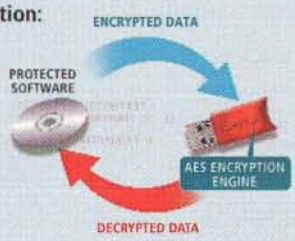

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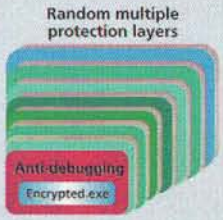

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Flexibility of tools and functionality	10%	93.3%	71.2%
Compatibility across platforms and environments	10%	93.3%	71%
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system and double click on the PackageManager application. Once opened, you should see a package named `_tkinter-x.x-binary` in the package list. Select this package and click on the install button in the form below the package list. That's it. You should now be able to create Python programs with a Tk-based graphical interface. If you wish to try it out, you can just run the simple application below to see a quick "hello world" dialog.

Listing 1: TkinterSample.py

TkinterSample.py

Create a new Tk application with a root and label object and display it to the user.

```
from Tkinter import *

# All Tk applications should have a root
root = Tk()

# Create a new label, assign it to the root, and give it the
text "Hello World"
w = Label(root, text="Hello world!", pady=10, padx=10)
# The command packs the root frame tightly around the label
w.pack()

# This command starts the main Tk event loop
root.mainloop()
```

To run this program, you'll need to run the script through the Python interpreter by typing `pythonw TkinterSample.py` into the Terminal. One thing to take notice of, is that we use something called `pythonw` rather than calling the normal Python interpreter to run our program. The reason for this is because our application is a window-based application (i.e., it does not display inside of the Terminal). The `pythonw` script executes the Python interpreter using a fully qualified path to overcome a bug within OS X. This allows a Python GUI-based application to interact properly with the Window Manager.

If you got everything typed in correctly, and you used `pythonw` instead of `python` to run your script, you should see a dialog that looks similar to the one in the figure below.

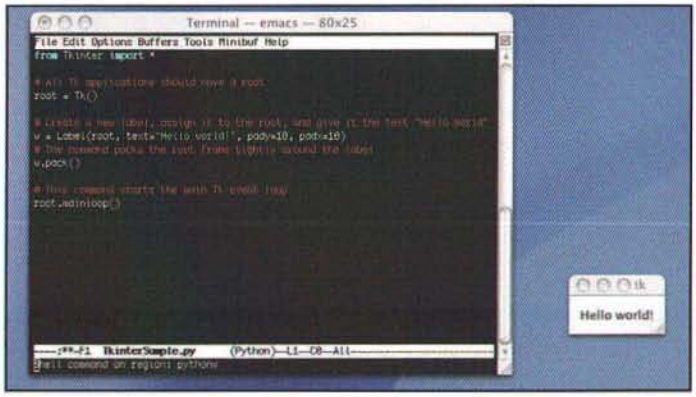

Figure 1 - TkinterSample.py and Emacs

Well then, you've tried out the short application above to make sure that your installation of Tkinter works properly, and you're still curious to learn more. Well have no fear, wxPython is another very popular GUI library for Python and we're going to cover it in the very next subsection.

wxPython

Back in 1992, at the Artificial Intelligence Applications Institute, at the University of Edinburgh, Julian Smart was designing a tool that needed to run on both Windows PCs and X-based Unix workstations. The existing cross-platform GUI libraries were all too expensive for an in-house experimental project, and so the decision was made to develop an easy to use, cross-platform, GUI library. Thus, wxWidgets was born—actually wxWindows at the time, the name was later changed.

Over time, the library developed a strong following, and in 1996, a version for the Python programming language was created by Robin Dunn. The port for Python was called wxPython, and it was implemented as an extension module wrapping the wxWidgets C++ class library. Since then, the wxPython library has grown to become a very stable, powerful, and easy to use GUI toolkit. Just like Tkinter, it has been ported to nearly every computing platform imaginable, which means that - when using wxPython - you'll be able to develop your GUI-based apps with little regard for the final target architecture or operating system.

The wxPython library is an Open Source project, so the source code can be downloaded and manipulated if need be, but the most important thing to remember is that Open Source means free, as in beer. Just like Tkinter, you can download, use, and freely distribute applications that you create with this library without paying a fee to anyone. The library is also extremely easy to install, since a binary installer is available for the Mac OS X platform which can be found at the main wxPython website <http://www.wxpython.org/>.

Through my experiments with wxPython, I have found that I prefer it to all of the other GUI libraries that I have tried thus far. I found its installation to be the easiest out of the GUI libraries listed in this article and its popularity is second only to Tkinter and rapidly gaining on the Tk toolkit. Also, just like Tkinter, there are ports of the library to several other popular languages. So, by learning Tkinter or wxPython, you are essentially getting a tool that can be used with several different languages and not just for Python development.

Other Libraries

As I stated in the section introduction, I decided to cover the two GUI libraries that I found to be the most popular. The reason for this was that, I had assumed (however wrong my assumption may be) that the most popular libraries would be the easiest to use, the easiest to find help for, the most stable, and the most available to the consumer of our applications. That said, there are several other very nice options for Python GUI-based development, a few of which we'll quickly look over in the remainder of this section.

For anyone who wants to develop applications specifically for the Mac OS X platform, PyObjC provides a bridge between the Python programming language, and the Cocoa Objective-C

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classes. With PyObjC installed, you can create OS X native applications using the Interface Builder application to create your GUIs. For those of you interested in using the PyObjC Bridge to create your Python applications, we'll be covering it in the next section on code editors and IDEs.

If you're not really interested in Cocoa development, you're looking for something a little more cross-platform, and you have experience with Java, you may want to look into Jython. Jython is an implementation of the Python language written in 100% pure Java, so it's actually much more than just a conduit to Java's Swing library, but for the purpose of fitting into this section, we'll look at as such.

Ok, I know what you're thinking. Why would I ever need a Java implementation of Python? Well, just let me point out a few of the reasons why you may find Jython useful when developing Python applications.

First, having Python implemented in Java means that you now have the ability to run Python applications on any system that can run the JVM. This opens up the opportunity of writing programs for many more platforms, since nearly every platform now runs Java.

Second—and what I really wanted to cover in this section—if you're like me and you basically cut your teeth on Java, then Jython gives you a good starting point to get up and running quickly with Python, without the additional overhead of learning a GUI library as well. When I first started learning Python, I was able to write GUI-based applications in Python using Swing—with which I already had quite extensive experience. This meant that I was able to concentrate more on learning the language, and less on learning a GUI library.

Finally, there's PyQt. Trolltech's Qt is a very popular GUI library for Linux programming, but it also happens to be a very able toolkit on several different platforms (including Windows and Mac OS X, of course). PyQt is a set of bindings for Trolltech's Qt GUI toolkit and like many of our other libraries, it's available on a non-commercial license for free, and can be downloaded at <http://www.riverbankcomputing.co.uk/pyqt/download.php> My only complaint about using Qt is that it doesn't seem to scale that well. Larger projects written in PyQt seemed a bit sluggish, even on a beefy G4, 1.25GHz processor and 1GB of RAM. Although, with that said, I have noticed that larger projects using some of the other libraries are not the speediest either. It would seem that very large-scale, GUI-based projects might still be out of reach of the Python developer for the time being; much like the Java-based apps of a few years ago (recently Java applications have become much more responsive, though still a little too slow for my taste).

Scientific Libraries

Since overhauling their operating system by adding Unix underpinnings to its already venerable user interface, Apple has been gaining ground in the scientific community. Researchers in Bioinformatics and Computational Biology, Applied Physics, and Mathematics—you name it—have found OS X to be a formidable system for research as well as their day-to-day tasks. The Mac OS provides a scientist with an all-in-one solution. OS X makes it easy for a researcher to run all of the Unix-based scientific apps they need, develop programs in a multitude of scripting and programming languages, write their research

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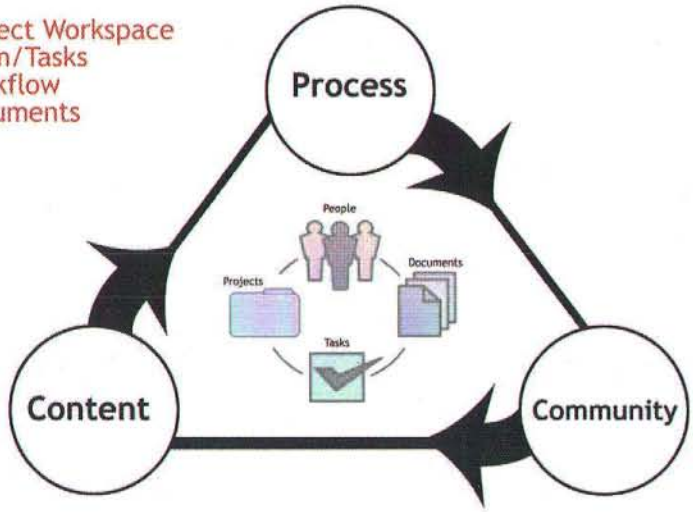

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One thing that you'll find common across most scientists is a need for powerful scripting languages. Bioinformatics, for example, is one area of research where we have seen a strong use of popular and powerful scripting languages. Perl has historically been the scripting language de rigueur for many bioinformaticions, but Python has been steadily gaining ground for several years now. Loved by many for its combination of power and readability, (the latter of which is something that many will say Perl definitely lacks) Python has grown on the scientific community, and we are starting to see several different libraries created specifically for the tasks required by these researchers.

The rest of this section will try to introduce you to a few of the more popular libraries for researchers. So, for any of you out there considering graduate school a possibility in the near future, listen up and take notes.

NumPy

Numerical Python, or NumPy, is a library created principally by Jim Hugunin while a student at MIT, and currently maintained by a group of developers headed by Paul Dubois. This library provides Python with the facilities to handle matrices and Linear Algebra mathematics. It's a powerful library that is extremely easy to install, as well as use.

Installation of the NumPy library is typical of most python command line installations, that is, you'll need to run a setup script through the Python interpreter with the command line argument `install`. In our case we will need to modify this a bit by using the `setup_all.py` script instead, and thus, our install line should look like this: `python setup_all.py install`.

Running this line from the NumPy directory in the Terminal application should install NumPy on your system without any problems. Before you get started with the installation, however, you may need to download the library. You can do so at its homepage at <http://www.pfdubois.com/numpy/>.

One more thing: you may need to be `root` to install the library. So, if you run into any problems during the installation, especially ones that mention invalid permissions, you may want to try running the script again, this time with the `sudo` command.

Once you get NumPy installed, and you're able to play around with it a bit, you'll notice how greatly it simplifies doing complicated linear algebra in your Python programs. However, even though it's great by itself, the true power of NumPy can be appreciated only when coupled with other libraries such as the popular DISLIN library—a library for data visualization. With that thought in mind, it only seems natural to look into the DISLIN library next.

DISLIN

DISLIN, as was mentioned in previous subsection, is a library for producing data visualizations. It's cross platform and also quite easy to use. Once again though, we have found a tool that makes use of X windows to produce its visual displays. So, remember when running your DISLIN visualizations, you must run them from whatever X windows implementation you have decided to install on your system.

Even with the caveat that we have to run our visualizations under a distribution of X windows, the library is definitely worth the download, if you plan on doing anything where it will

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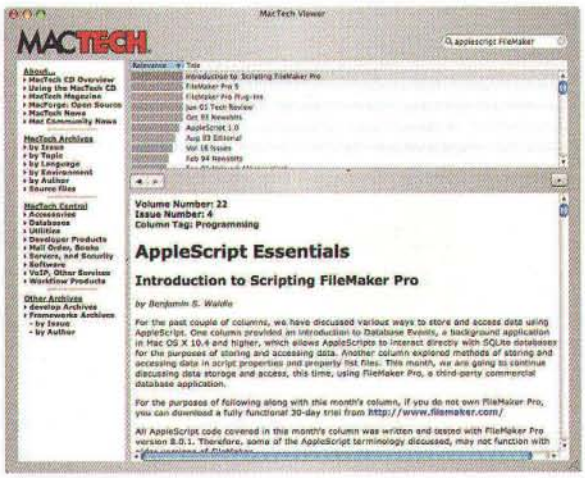

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become important to graphically visualize large sets of data. So, I would suggest that you run out to its homepage <http://www.mps.mpg.de/dislin/> and download the Darwin, ppc distribution for the Mac.

Once you've downloaded the library and unpacked it into a temporary directory, you can proceed with the installation of the package. Once again, this library will need to be installed from the command line (no binaries available, but hey its free, so stop complaining). This one is a bit more complex than the one for NumPy, but all of the steps are clearly labeled in the README file provided with the distribution. Just make sure that you don't stop after the installation, but that you also run through the directions for using DISLIN with Python that are listed below the install instructions.

Once you've got the library properly installed, you'll definitely want to give it a try. So, to satisfy your curiosity, and also as an example of the ease at which you can create impressive data visualizations using Python and DISLIN, I have included the code for a simple surface map visualization below.

Listing 3: NumPy and DISLIN sample surface map application

surface_map.py

Creates a surface map visualization using NumPy and DISLIN.

```
from dislin import *
from Numeric import *

z_mat = zeros((180,180),Float)
x_ray = arange(180.0)
y_ray = arange(180.0)

dtr = 3.141592654/180.0

for x in x_ray:
    for y in y_ray:
        z_mat[int(x)][int(y)] = sin(x*3*dtr)*sin(y*2*dtr)

surshade(z_mat,x_ray,y_ray)
disfin()
```

The results of running the code above, through the Python interpreter from X11, can be seen in the figure below. Take notice of how very little code you need, to perform a complex visualization like the example that was provided. (See figure 2.)

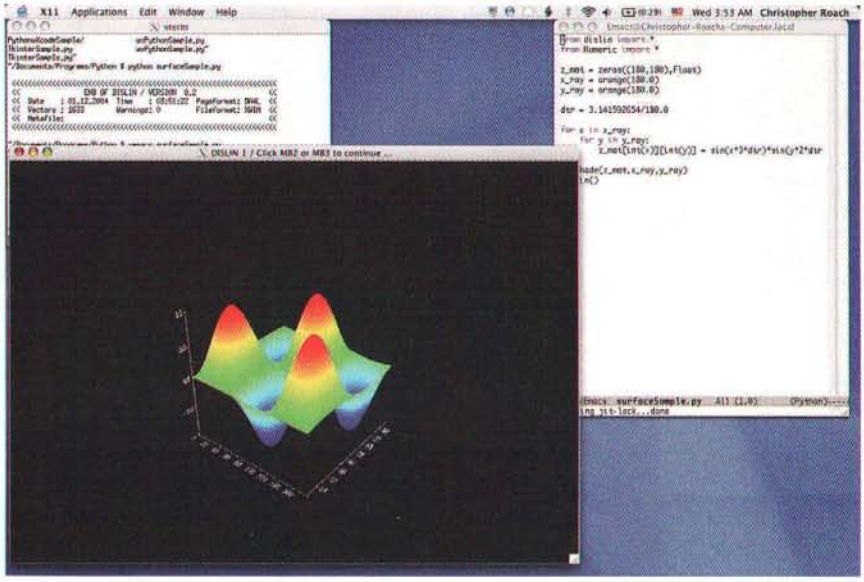

Figure 2 - DISLIN surface_map.py Sample

Biopython

With the overwhelming popularity of the Bioinformatics field recently, I feel it is important to have a portion of our discussion look into at least one library for researchers in this field. Yet, keep in mind that I am not a researcher in the computational biology field (my chosen area of study is Computer Science), nor do I profess to understand all that I am about to cover below. Regardless of my ineptitude, however, I hope that at least a few bioinformaticions out there will find this subsection to be helpful and informative.

So, with that disclaimer out of the way (and hopefully all the hate mail from the bio-crowd avoided), let's take a look at the Biopython set of tools, and what they have to offer the scientific community.

First, Biopython refers to a project that brings together many developers of freely available Python tools for computational biology. Biopython also refers to the tool suite that is available online at the Biopython website <http://www.biopython.org>. There are several tools for running common operations on sequences as well as the data structures to represent them. There are tools for running translations and BLASTing and for performing classifications of data using k Nearest Neighbors, Naïve Bayes, or Support Vector Machines. Biopython is an extremely large and comprehensive set of tools for the biological researcher.

For grins and giggles, I decided to download Biopython and try it out (I had recently begun looking into pursuing a bioinformatics path for my Ph.D., although I may be rethinking that again very soon). I found that the installation was actually not very difficult as long as you don't mind command line installations—sorry, once again no binary distributions here—however, it was very time consuming. Biopython has so many tools that it has quite a large set of dependencies, so I found myself downloading and installing quite a few other packages just to get it to work on my machine.

Nevertheless, after about an hour or so, I finally had it installed (with a few optional libraries left out) and I was able to write up a quick script that took a DNA sequence and returned its RNA translation. Not that I understood what I did, mind you, but I did feel like a scientist for a very short time, and in the process I found that the library should be very intuitive for anyone already possessing knowledge of the bioinformatics field.

Also, as a hint for anyone wishing to install this library, first download and install Fink (a project dedicated to bringing Unix Open Source software to OS X). I was able to use it to install most of the dependencies of Biopython, making the installation a heck of a lot simpler.

A Few Others

In the final section I wanted to just quickly mention a few other libraries that I found for Python, which were no less important than those in the sections prior, but since I'm not writing a book, I had to draw the line somewhere. So, this section just quickly introduces a few more libraries that I think are must haves for any serious Python programmer.

We'll start with a couple of libraries that allow Python scripts to access and utilize arguably the two most popular open source databases: MySQL and PostgreSQL. Then, we'll quickly look into two more libraries that allow the Python programmer to create 3D graphics on OS X.

Databases

In order to standardize the many modules that allow Python developers to access a database, a database API specification, which is currently in version 2.0, was developed. This makes Python programs that access a database, not only easier to write, but also infinitely more portable, since all that needs to change for the code to work with another database is the module that implements the specification.

In this section I wanted to quickly point out two modules that allowed Python programmers to access two of the most popular Open Source databases. These modules are: MySQLdb and PyGreSQL, both, of course, are compliant with version 2.0 of the Python Database specification.

The first, MySQLdb, is, of course, an interface to the MySQL database. This module is fully thread safe and supports transactions. It's easy to install and easy to use, and it can be used with any version of Python above v1.5.2, and with versions of MySQL v3.22 or greater.

The other module I wanted to point out works with the PostgreSQL database. PyGreSQL is the name of the module that provides Python with the ability to access and utilize a PostgreSQL database.

If neither database is currently installed on your machine, and you're not particularly interested in going through a long install with the source, Marc Liyanage has links and instructions on his website <http://www.entropy.ch/software/macosx/> for downloading and installing each database on OS X with a binary installer.

If, however, you prefer installing from a source distribution, you can find some documentation on installing each one in the Open Source section of Apple's Developer Connection <http://developer.apple.com/ internet/opensource/index.html>.

Once you've installed the databases, you'll be ready to install MySQLdb and PyGreSQL modules. You can find the MySQLdb module through the Sourceforge site at the following address: <http://sourceforge.net/projects/mysql-python> The PostgreSQL database module, PyGreSQL, can be found at its homepage: <http://www.pygresql.org/>

Graphics

There are several choices for graphics libraries when working with Python on the Mac. As I already mentioned earlier, Python developers on the Mac have access to the DISLIN visualization library. However, these obviously are not the only ones, in this section I'll quickly introduce two other 3D graphics libraries.

To start with, VPython is a data visualization library similar to the DISLIN library. However, its main aim is ease of use, and at least from my readings, it seems as if it is being geared towards students in the sciences. As for the installation of the library, my recommendation would be to install it from Fink (use the command `fink install visual-py23`), and that seems to

be the general consensus since even the homepage of VPython <http://www.vpython.org> recommends the same.

The other library gives us access to what is probably the most popular cross platform graphics library: OpenGL. PyOpenGL binds Python to the OpenGL 3D graphics library, version 1.1. The library is a bit behind, since at last check, OpenGL was up to version 2.0. Nevertheless, it works well, it's cross platform, and it's extremely easy to use.

Once again, this library does not have a binary installer, so you'll have to download the source <http://pyopengl.sourceforge.net/> and build it. Nevertheless, when I built the library on my machine, the build and install steps went by without any incident whatsoever, and before I knew it, I had a sample Python-based OpenGL program up and running.

Conclusion

Well, we've certainly covered a lot of ground over the course of this article. I hope you've found some interesting new tools to play with in your future Python development. I also hope that I've inspired you to go out and start doing some research on the web to find even more new tools for your Mac. And who knows, perhaps you'll find a void somewhere out there in the tools available, and you'll be able to organize an effort that delivers another powerful library back to the Python community.

This article's main objective was to whet your appetite, and hopefully get a few of you to try something new in your daily development ritual. In the future, I'll be publishing a few articles that take a look at some of the technologies we covered here, a little closer. So, if you enjoyed this article, and you find yourself thirsty to learn some more, have no fear, I'll have a few more in depth tutorials out there for you to sink your teeth into, sometime very soon.

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http://pyobjc.sourceforge.net/
http://www.biopython.org/
http://www.pfdubois.com/numpy/
http://www.linmpi.mpg.de/dislin/
http://sourceforge.net/projects/mysql-python
http://www.druid.net/pygresql/
http://vpython.org/
http://pyopengl.sourceforge.net/

About The Authors

Christopher Roach recently earned his MS in Computer Science from Virginia Tech and currently works as a software engineer in Florida's Space Coast. On the weekend he tries to find time to write articles on Macintosh programming and do battle with insanely powerful hurricanes, while still trying to preserve some semblance of a life. If you have questions or comments on the article, you can email him at croach@vt.edu


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by Edward Marczak

Directory Service Recipes

More Directory Services manipulation via the Command Line

Introduction

Directory Services: used every day by users of OS X – whether they know it or not. Last month, this column covered the basics of directory services, and gave a few sample ideas. This month, I'll trot out some very practical uses of the command-line directory service tools.

Power Station

As I've alluded to in the past, command-line tools and scripting – shell based *or* GUI based AppleScript – can be much more powerful than GUI tools. Also, while I pointed out that LDAP is not a database, people still tend to think of it as one. The confusion is understandable: Directory Services protocols allow you to retrieve information via lookups. Depending on the protocol and your access, it may allow you to be the one to store information, too. Like any database, the retrieval of information is key: it would be useless if you could put information into the store without being able to access it. Combined with scripting, not only can we access data, but we can perform actions using the results.

Let's start out with reading and reporting on values. OS X Server using Open Directory stores just about everything for a given user in a record in LDAP. Sometimes, you'll want to know which users have some attribute. I do a lot of work with OS X e-mail systems, and a common request is an easy way to report on which users have mail enabled (or, conversely, which users are *not* mail enabled). Here's a handy little script that will do just that – show which users are set up for OS X e-mail:

mail-enabled.sh

```
#!/bin/sh

for user in $(dscl /LDAPv3/127.0.0.1 -list /Users)
do
        me=$(dscl /LDAPv3/127.0.0.1 -read /Users/$user
MailAttribute)
        if [ "$me" !=  "No such key: MailAttribute"  ]; then
                echo "$user"
        fi
done
```

Do notice here that we're relying on the ***failure*** to find the attribute as a way to make our determination. If you want to find users who do not have mail enabled, just change the test from not equal ("!=") to equal ("=="). If you're a Kerio Mail Server user, and are using the Open Directory extensions, rather than "MailAttribute", you want to look for "kerio-Mail-Active: 1". Run this right on your OD master or replica to get your results. This can be extended to run from cron every night and produce a report via e-mail. You could even redirect the results to a file and use diff to report on new mail users, and users that have been disabled.

Everything but the Girl

Let's even go easier, but potentially more useful. Hierarchies on a network are useful. People tend to think in that manner, and like to press them into service. If you're using OD based logins, with ***or without*** network home directories, you have a handy tool at your disposal: your user list. More than once, I've been asked to create a sharepoint on the network, and then fill it with a directory for each user in the system. On a large system, this could be incredibly tedious. So, you script it. Or, in this case, you can even one-line it:

```
dscl /LDAPv3/127.0.0.1/ -list /Users | xargs mkdir
```

Of course, that will create directories at your current place in the structure. This means that you'll want to cd to the location you want them before running this command.

While handy, you probably need a little bit more, like setting the correct permissions, or even copying some default information into each folder. An easy framework for that is:

```
#!/bin/bash
dscl /LDAPv3/127.0.0.1/ -list /Users | while read user
do
  #Do your work here
done
```

Quick results from little work!

(Don't Burn the) Midnight Oil

Another really handy scenario crops up with OS X 10.4 in an all OD network. Using a tool like Apple Remote Desktop, you can certainly create local admin users on all machines in your network very easily. However, that can become a small management headache: If you want to change the password for the admin user, then you have to remember to get every box. It also doesn't allow for any fine-grained control. One great solution to this is to create admin groups in OpenDirectory. You can then nest these groups inside of the local NetInfo admin group. From there, simply moving

users in and out of the OD admin groups will give them the correct permissions on a given machine. Let's look at an example.

Imagine that a company (or school) has two open labs: one for word processing/presentation development, and another for 3-D graphics. Each lab has a local support team that need admin rights to the Macs. You would create three groups in OpenDirectory: WPLabAdmins, 3DLabAdmins, and UberAdmins – the final group being able to administer both labs. Assign users to the appropriate groups. You'll then need the OD group's UUID, which of course can be scripted. Create the script as update-admin-group.sh:

update-admin-group.sh

```
#!/bin/bash
theUUID=$(dscl /Search -read /Groups/$1 apple-generateduid |
sed 's/apple-generateduid: //g')
dscl /NetInfo/root -create /Groups/admin NestedGroups
$theUUID
```

Then, run it on each group of machines as appropriate:

On all machines:

```
update-admin-group.sh UberAdmins
```

On the word processing machines:

```
update-admin-group.sh WPLabAdmins
```

Finally, on the 3D machines:

```
update-admin-group.sh 3DLabAdmins
```

Now, as people need admin access to a given machine, they can simply ***use their own OD ID***. Very, very cool. Once this is set, you can just move people in and out of OD groups, rather than futz with anything on any local machine. Much better, right?

Ah Ha!

`dscl`: incredibly useful. However, I'd be remiss if I didn't mention its counterpart that appeared in 10.4: `dseditgroup`. `dseditgroup` appeared to make it easier to work with groups, especially with the new ability to have nested groups.

By default, dseditgroup operates on NetInfo data, but, as the 'ds' suggests, will work with any Directory Service plug-in. This includes anything you can set up in Directory Utility, such as LDAP and Active Directory. So, while we're speaking about admin accounts, let's see examples of `dseditgroup` in action.

To read all information about a NetInfo group, simply use `dseditgroup groupname`. So, to see your admin group:

```
# dseditgroup admin

Recordname <admin>
10 attribute(s) found
Attribute[1] is <dsAttrTypeStandard:AppleMetaNodeLocation>
        Value[1] is </NetInfo/DefaultLocalNode>
Attribute[2] is <dsAttrTypeStandard:RecordType>
        Value[1] is <dsRecTypeStandard:Groups>
Attribute[3] is <dsAttrTypeStandard:RecordName>
        Value[1] is <admin>
Attribute[4] is <dsAttrTypeStandard:PrimaryGroupID>
        Value[1] is <80>
Attribute[5] is <dsAttrTypeStandard:Password>
        Value[1] is <*>
Attribute[6] is <dsAttrTypeStandard:GroupMembership>
        Value[1] is <root>
        Value[2] is <localadmin>
Attribute[7] is <dsAttrTypeStandard:GeneratedUID>
        Value[1] is <ABCEEFAB-CDEF-ABCD-ECAB-CDEF00000050>
Attribute[8] is <dsAttrTypeStandard:SMBSID>
        Value[1] is <S-1-5-32-544>
Attribute[9] is <dsAttrTypeStandard:RealName>
        Value[1] is <Administrators>
Attribute[10] is <dsAttrTypeStandard:GroupMembers>
        Value[1] is <43C93B6A-CFB9-4C24-A464-EA51320B62D2>
        Value[2] is <F047F2F1-F5A9-4B73-BBB4-454550B09CB4>
```

The same thing can be accomplished for an OD group, using the `-n` switch:

```
# dseditgroup -n /LDAPv3/127.0.0.1 admin
```

`dseditgroup` also has operations to manipulate groups, either local (NetInfo), or other datastore. To remove a user from an OD admin group, you could handle it this way:

```
dseditgroup -o edit -n /LDAPv3/127.0.0.1 -u admin-user -p -d
user-to-delete -t user admin
```

Note that sensitive operations against Directory Services will require authentication, as seen here with the -u and -p flag.

Conclusion

Directory services in general are an incredibly powerful way to maintain a central store for objects on a network, easing administration. The usefulness of these services wouldn't be diminished if only GUI tools were available. I do hope, though, that I've illustrated how powerful scripting and command-line tools can be, and what they bring to the process.

Media of the month: Michael Bartosh's posthumously released *Mac OS X Tiger Administration*. A surprise follow-up to his *Panther Server Administration* after being told that the Tiger version was cancelled. This PDF-only version of the book was started by Michael, and completed by several of his good friends after Michael passed away. It's available from <http://www.oreilly.com>.

Again, it's time to make your plans for MacWorld! Hope to see people on the show floor, or at either of the sessions I'll be presenting (old news to long-time readers of my column, though!). In any case, I'll see you in print next month.

References:

dscl man page

dseditgroup man page

About The Author

Ed Marczak owns and operates Radiotope, a technology consulting practice with a focus on business process enhancement, network and system integration, and, more generally, all things Mac.

Virtual Computing With Parallels Desktop

How to leverage Parallels Desktop for Mac to run Windows and Linux VMs

By Mary Norbury

Buzzword

Why is ***virtualization*** becoming the new industry buzzword? It's certainly not new. IBM has been developing virtual machine systems since the mid-1960's when they virtualized server memory. In the mid-1980s, we saw CPU and I/O virtualization and the 1990s brought the technology to open (Unix based) systems. Cluster and grid computing have long provided resource virtualization solutions. Linux distributions such as Novell, Redhat and Sun are embedding the Xen VM (virtual machine) monitor into their enterprise server editions. With Microsoft also entering the virtualization arena with its acquisition of Softricity and partnership with Xen through Xensource, the market is heating up with new possibilities and choices.

Enter Apple with their new Intel line of mobile, desktop and server computers and virtualization comes to the Mac.

Apples and Oranges

It was no surprise that Apple introduced Boot Camp; clearly ***someone*** was going to accomplish booting Windows natively on an Intel Mac so it made sense that Apple created their own neat solution. This had such a major impact on how Mac users view Windows interoperability that Microsoft will no longer offer upgrades or full releases of Virtual PC for Mac. Emulation is out because we don't need it anymore.

Installing Boot Camp is a bit more difficult than Parallels and there are some pitfalls: you can't install it on your Mac if you've already got a partition so you'll need to restore it to a single volume; you're limited to creating a static partition less than 32 GB and formatting it as FAT32 rather than NTFS if you want to write to the partition after installing Windows (if it's larger than 32 GB then you'll have to format it as NTFS and it will then become read-only for Mac OS X); the partition you create is static in size; you can only install Windows XP Pro or Home and you can't multi-boot different versions of Windows since Boot Camp only supports dual-boot [Ed. Note – but you ***can*** overcome this: see Criss Meyers' article, "Triple Boot Your Mac" in this month's issue!]. The newest beta of Boot Camp v.1.1.1 fixes some bugs, adds support for the Mac Pro line and includes a preset button for the 32 GB size option. You can upgrade your existing Boot Camp install as long as you don't intend to change the partition size (http://www.apple.com/macosx/bootcamp/).

This begs the question about installing Linux on Intel Macs using Boot Camp. This is possible, but creating a bootable Linux partition is a bit trickier because you want to make sure you don't change the partition table during install; Boot Camp creates a hybrid partition table where XP's legacy MBR (Master Boot Record) and the Mac OS X GPT (GUID Partition Table) can co-exist and play nice. Since Boot Camp was only intended for an XP dual boot setup, adding Linux can be a challenge. But to nitpick, Mac users have been able to dual boot Yellow Dog Linux on PowerPC's since 1999 so the Intel Mac and Boot Camp complicate the Linux experience rather than enhance it.

On the other hand, Boot Camp is undeniably faster than Parallels because it runs natively and gives Windows full access to the CPU, graphics and other hardware. Parallels is a virtual machine environment and therefore only sees a dual core system as a single core with an 8 MB graphics card, no matter how good of a video card you have installed.

Why Be Limited To Windows?

A colleague and MacTech author Dean Shavit, who writes "The Source Hound" column, states in his bio that he hates to pay for software. Hmmmm...well, we're ***all*** for "free," and feel especially blessed when, on rare occasions, "free" equals "awesome". Boot Camp is free and fast and pretty damn good....but Parallels Desktop accomplishes more than allowing a dual-boot with Windows XP or a difficult triple boot system with Windows XP and Linux. With Parallels, you can ***run multiple virtual machines simultaneously*** and you don't have to boot the Host (Mac OS X) OS. You aren't limited by your personal choice of operating system. You can move seamlessly between Host and Guests. Is this worth paying for? Hell, yes.

Nitty Gritty

Parallels Desktop for Mac is available from http://www.parallels.com with a trial key or purchase for $79.99.

Download the package and follow the instructions for installation. Launch Parallels.app and select the New VM... button to create a new virtual machine. You'll be asked which

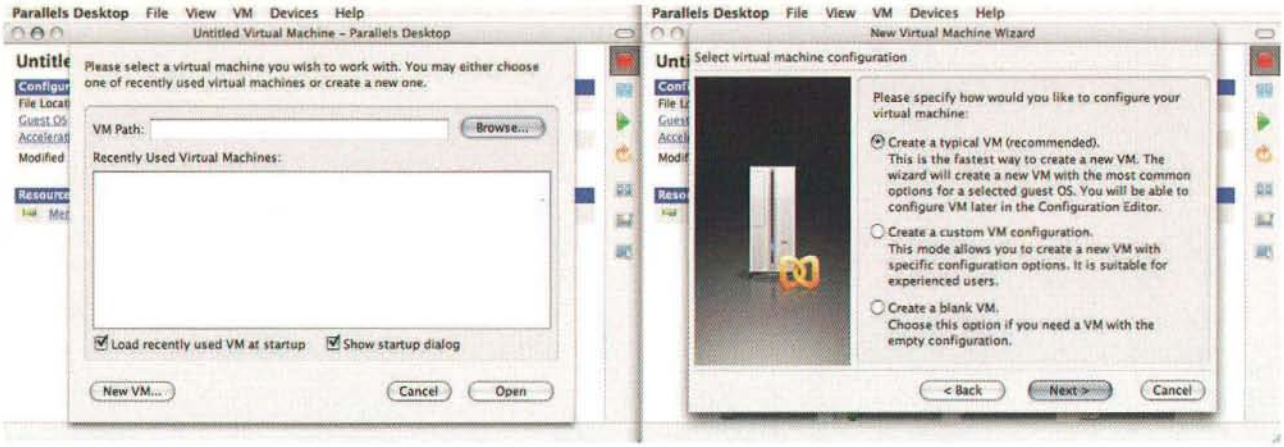

Figure 1. Create a new VM and choose configuration type

Figure 2. Choose the Guest OS type and Guest OS version

type of VM configuration you want to create (typical, custom or blank). The Configuration Editor can be used later to reconfigure settings.

Choose the Guest OS type and the version: (See Figure 1. and Figure 2., page 33.)

Name your virtual machine and choose a location to save the configuration file (let Parallels Desktop create the .pvs VM config file for you automatically). Two files make up a VM: the .pvs configuration file and a hard disk image file. Parallels Desktop can run one VM (or one config file) at a time. Launch Parallels Desktop for each individual Guest OS.

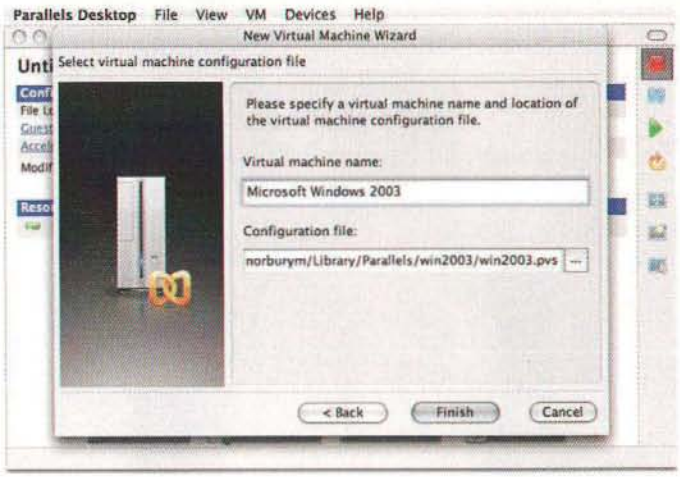

Figure 3. Virtual machine name and configuration file location

In the Property Page, you'll activate Parallels Desktop (Help - Activate Product...) with your trial key or your full registration activation key. Then, still in the Property Page, you'll make some changes to enable booting from your guest OS install CD. Under Configuration, locate the Guest OS line under File Location and click on the Boot Sequence link to open the Booting Options tab.

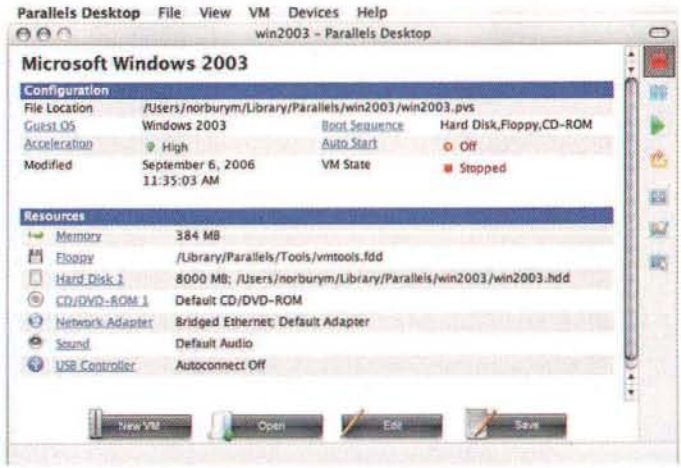

Figure 4. Property page

Choose the radio button to boot from the CD first.

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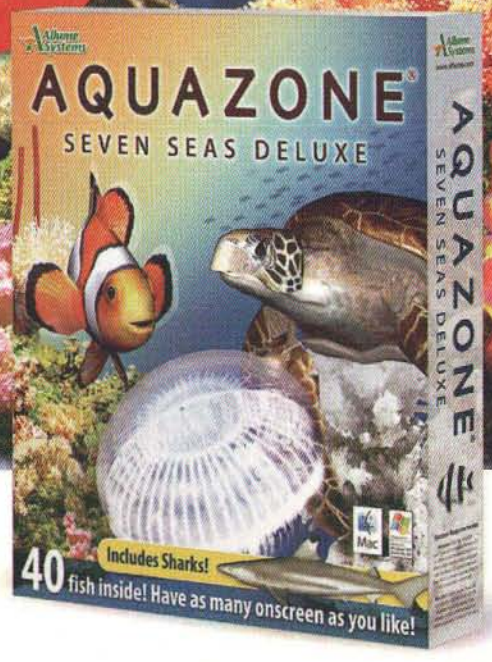

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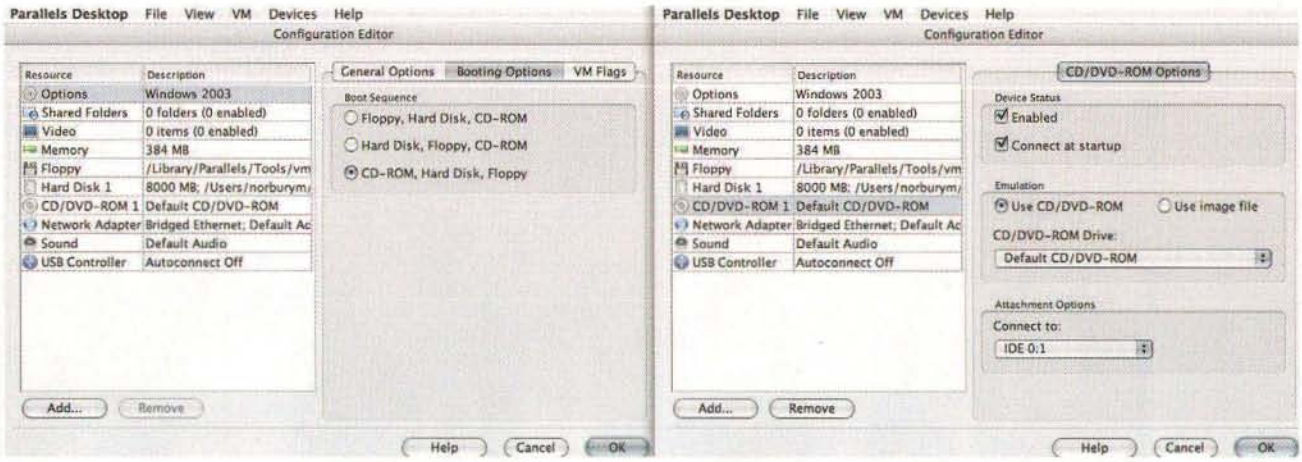

Figure 5. Change booting sequence in Configuration Editor

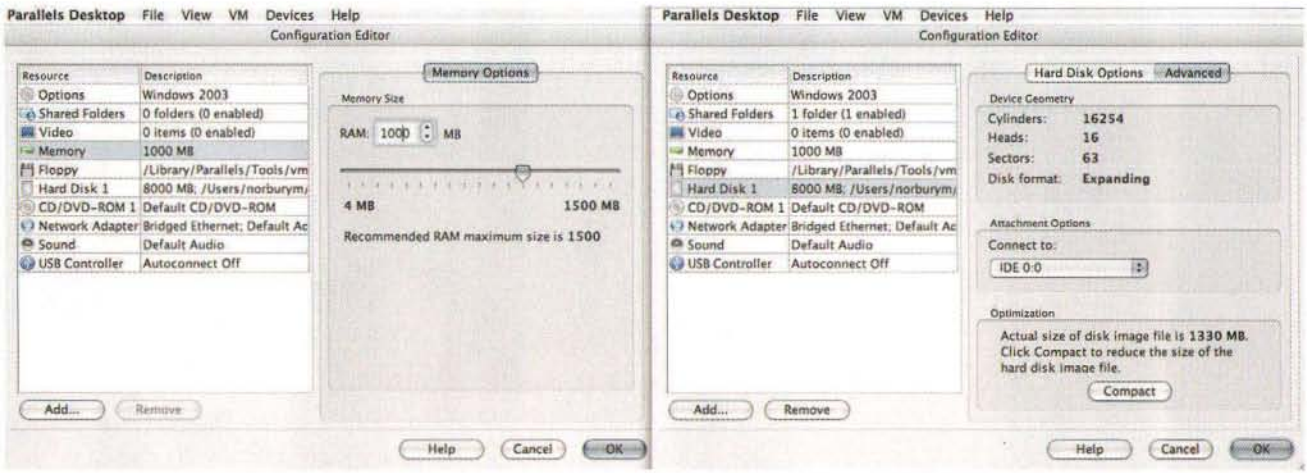

Figure 6. Adjust memory allocation and check hard disk options

Highlight the CD/DVD drive in the Resource pane and make sure the device is enabled and will connect at startup. If you are installing from an .iso image, an .img or an .fdd (floppy disk image), select the Use image file radio button and specify the path to the distribution file in the image file field that appears when the image file radio button is selected.

(See figure 5.)

Select the Memory option in the Resource pane and adjust the memory allocation. Windows XP or Server 2003 will run best with a minimum of 512 MB. Give it as much as you can afford. If you have 2GB RAM on your OS X system, give the VM 1GB. Linux flavors will demand less (256 MB minimum).

Highlight the Hard Disk Resource in the left pane and choose the Advanced tab. You'll see that my choice of a Typical creation of a virtual machine set the virtual disk size as 8000 MB with an expanding format. Note that the actual size of the disk image file (after full installation) is 1330 MB but will grow as new data is added so you don't have to worry about allocating enough hard drive space to the virtual disk before installing.

(See figure 6.)

Click the OK button to return to the Property Page. Click the Save button along the bottom of the window to save the VM configuration. Insert your guest install CD and click the green Power On arrow button to boot the VM and begin install. Parallels Desktop will detect the CD and start installation.

(See figure 7.)

During any Windows OS installation, you'll be confronted with the Microsoft Licensing Agreement screen, which requires an F8 key input to agree to the terms in order to proceed with the installation. On laptops, this is accomplished by enabling the "Use the F1-F12 keys to control software features" in the Mac OS X keyboard pref pane. Once enabled, you can use the fn-F8 key combination to agree to the MS Licensing Agreement and complete the installation. On desktop models that come with the Apple Keyboard, simply turn off (deselect) the F8 keys shortcut in the Keyboard Shortcuts pref pane and the F8 key will be functional in the Guest OS window.

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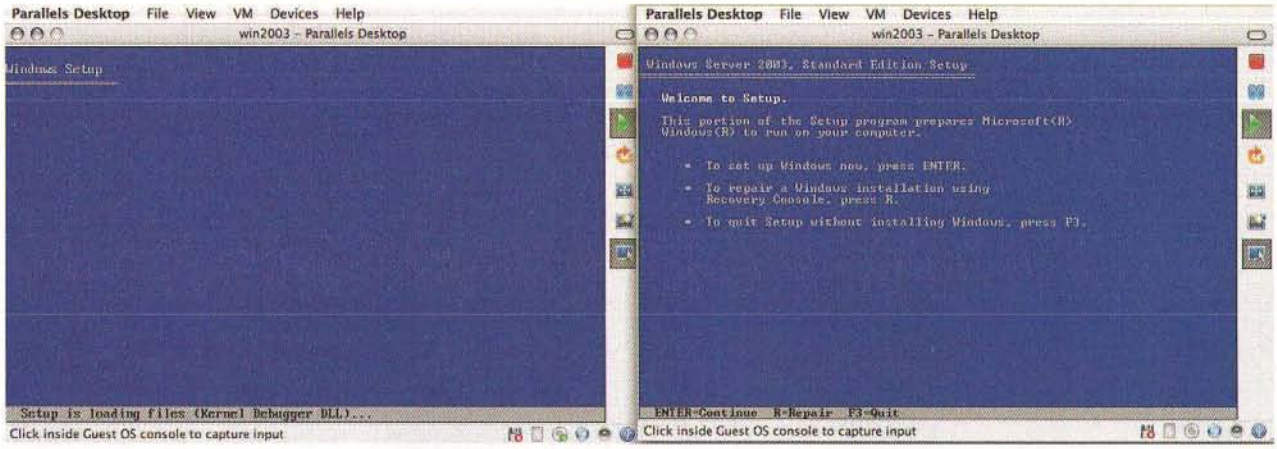

Figure 7. Windows Server 2003 installation

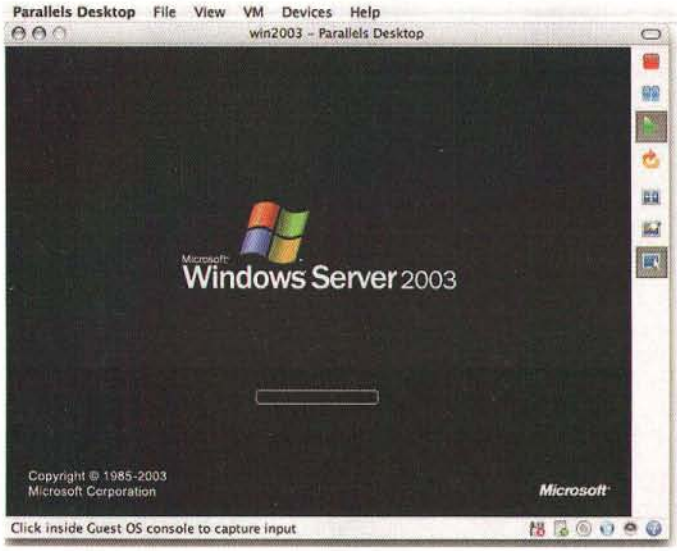

Figure 8. Windows Server 2003 booting up

Once installation is finished and you've created your account information, you can log into your new Guest OS by sending key combinations through the VM menu (Send Keys - Ctrl+Alt+Del). Start and stop the Guest OS by using the Power On (green arrow) and Power Off (red square) buttons on the toolbar on the right edge of the Parallels Desktop window (you can move the toolbar to the top or the left; go to Preferences - User Interface).

The next practical step is to run the many Windows OS patches from Internet Explorer (Tools - Windows Update from the IE menu bar), turn on automatic updates (Start button - Settings - Control Panel - Automatic Updates), turn on the firewall (Start button - Settings - Network Connections - Local Area Connection - Properties button - Advanced tab - Windows Firewall Settings button) and install an anti-virus software package. But don't worry: even if your PC virtual machine gets a virus, it won't spread to your Mac host. If you take advantage of a shared folder, however, be aware that you are opening a tunnel between a low risk world and a high risk one. Viruses may not exist for Mac OS X right now but in the future, the operating system may become a bigger target by virtue of this new ability to become bedfellows with operating systems fraught with vulnerabilities. If you choose to run an alternative OS on your Mac and plan to share files, then practice safe computing: keep all operating systems and applications up to date, run appropriate anti-virus software (take a look at ClamXAV for Mac at http://www.markallan.co.uk/clamXav/, open source and free!), and close all but necessary ports.

After taking care of this business, you can install Parallels Tools (available from the VM menu) which provides: better mouse synchronization (you can move seamlessly between the Guest OS console and the Finder without using hot key combinations to capture or release input), enhanced video performance, time and clipboard synchronization, a disk compacting tool and a shared folders tool. You'll need to be logged in to the Guest OS to install Parallel Tools.

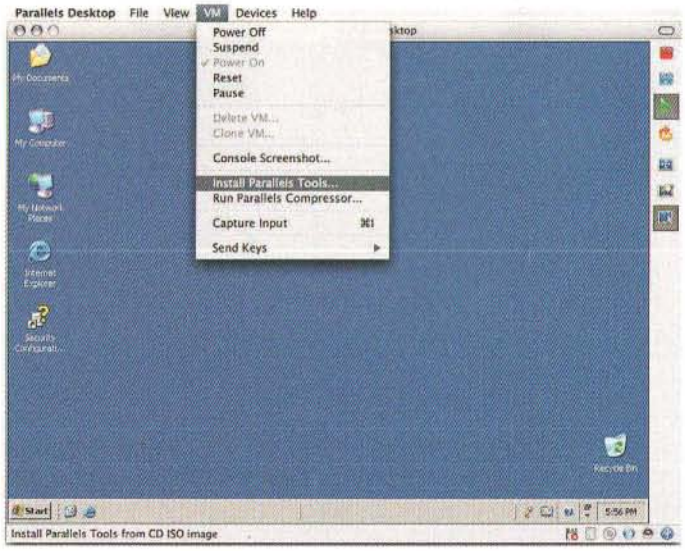

Figure 9. Install Parallels Tools

After completing the installation of Parallel Tools, shut down the Guest OS (do a graceful shutdown from inside the Guest OS or you may generate shut down errors when using the Power Off button in Parallels Desktop). You'll be returned to the Property Page. Click the Edit button on the bottom of the Property Page to return to the Configuration Editor. Highlight Shared Folders in the Resource pane on the left, select the checkbox for Enable shared folders and click the + button to open the Shared Folder Properties screen. Specify a Name and Path on your Mac OS X system for the shared folder (a shared folder on the Mac OS X desktop is convenient and sensible; create one if you haven't already done so) and select the Enabled option at the bottom left of the pane. Click the OK button.

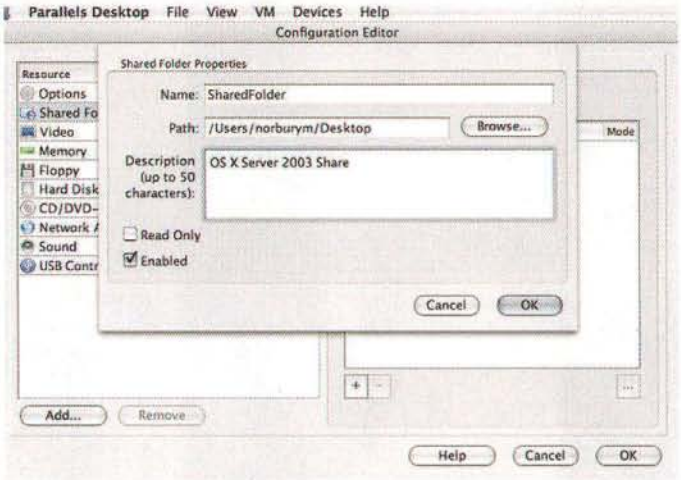

Figure 10. Create a shared folder

You're now at the Property Page again: click the Save button along the bottom of the window.

Power on your VM and log into your Guest OS. You should now see a Parallels Shared Folder on the desktop. Double-clicking it will open Windows Explorer. You can browse and write to the contents of the share from there.

If you have View Hidden Files and Folders set in the View tab of the Folder Options in Windows, you will see OS X's .ds store files.

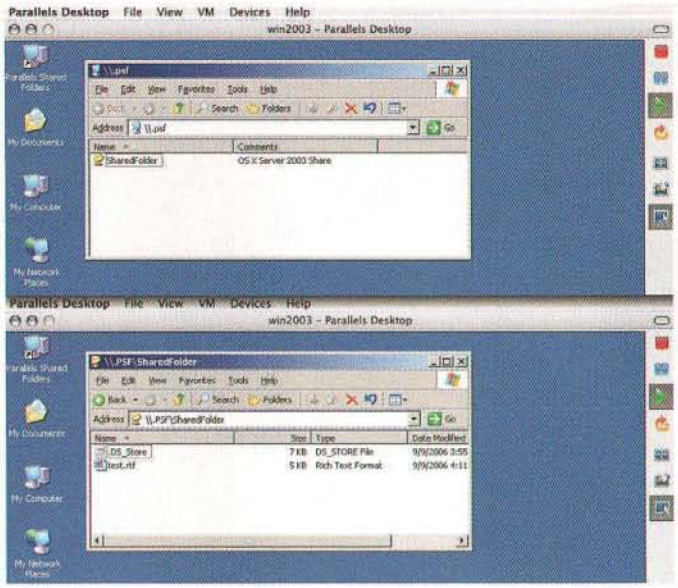

Figure 11. Shared folder

Or, you can write directly to the Windows disk. Each VM is assigned an independent IP address. Go to the Windows run line (Start - Run) and type cmd. At the prompt, type ipconfig and make note of the IP address. Enable a shared folder (My Documents on the Windows desktop, for example) and give yourself permissions to write to it. In the Mac OS X Finder, select 'Go' from the menu and choose 'Connect to Server'. Type in the VM IP address using the smb protocol (ex. smb://10.0.1.8). Click the 'Connect' button. Enter your Windows login and password with permissions to the share you created. Select the share in the next window and click 'OK'. The share will mount on your OS X desktop.

Another very cool feature is the ability to copy/paste between Mac OS X and Windows. No rebooting, no special keystrokes required.

You can also view devices connected to your system. Select VM in the menu bar and choose Devices.

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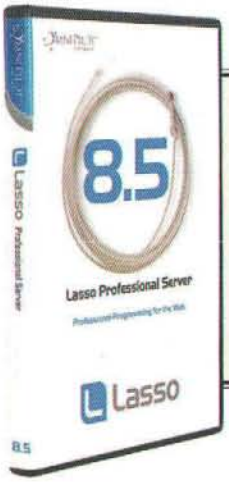

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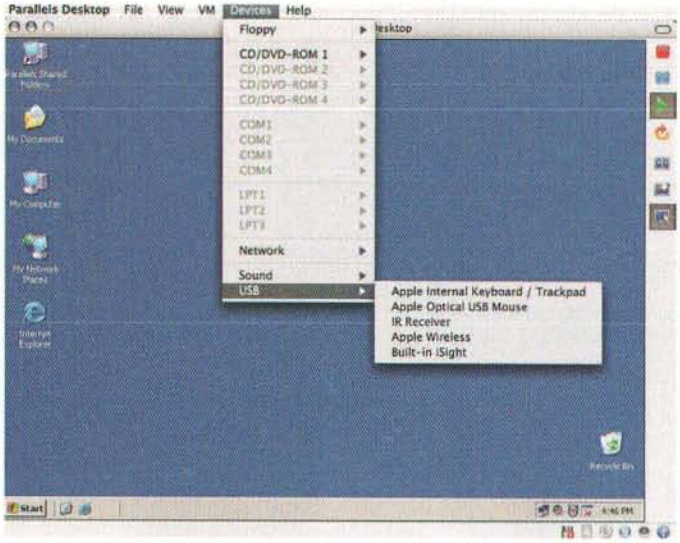


Figure 12. List of devices seen by VM

Parallels Compressor is a tool that allows you to manage the size of your virtual hard drives. Select it from the VM menu and click the Manual button to control how the drive is optimized: Express or Advanced. The Advanced Option allows for fine-tuning level of compression.

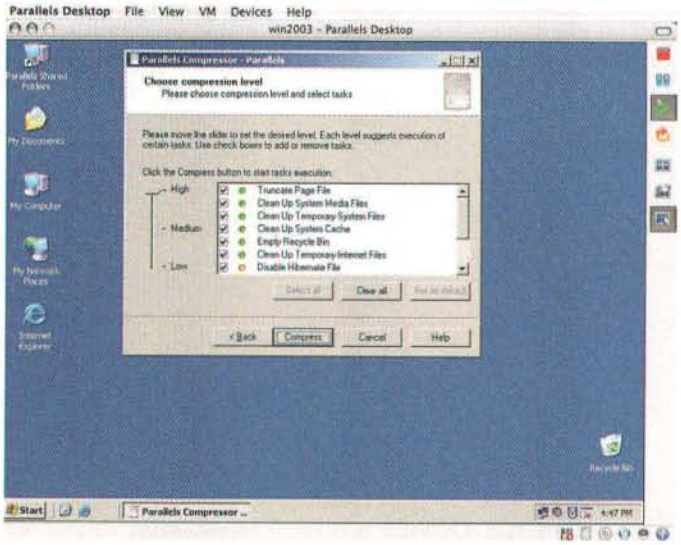


Figure 13. Parallels advanced compressor options

Linux distros are handled with similar ease:

- Create a new VM with the default Typical VM Configuration.
- Choose the Guest OS type (FreeBSD) and the version (Other FreeBSD since I downloaded FreeBSD 6.1, in my example. Get it at http://www.freebsd.org).
- Name the Guest OS VM (FreeBSD) and save the configuration file.
- In the Property Page, under Configuration, locate the Guest OS line under File Location and click on the Boot Sequence link to open the Booting Options tab.
- Increase the default memory allocation to 512 MB.
- Select the CD/DVD Resource option in the left pane of the Configuration Editor and choose the Use image file radio button. Select the path to the .iso image file.

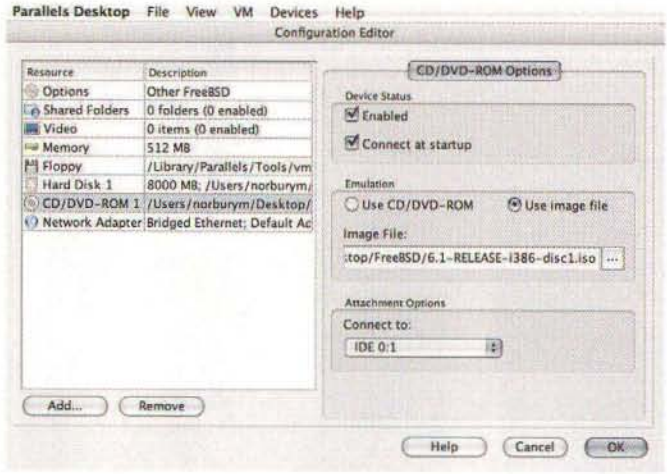


Figure 14. FressBSD image file

If you have not installed FreeBSD before, puhleeze read the handbook before and during installation: <http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/install.html>

When installing packages, you will most likely have to switch "discs". Go to Devices in the Parallels Desktop, select the CD drive and choose the option Connect Image...

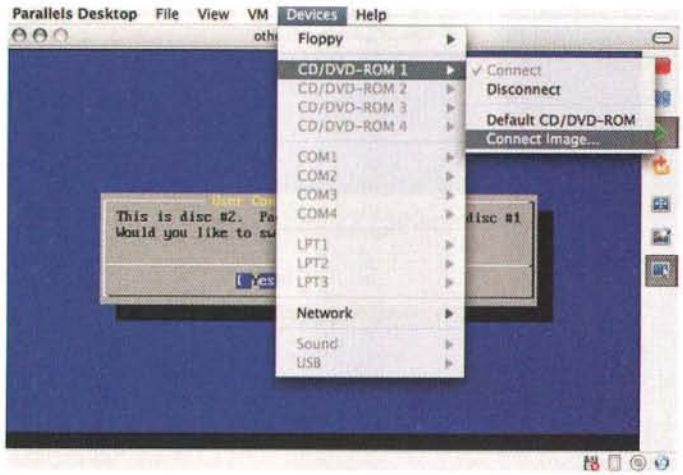
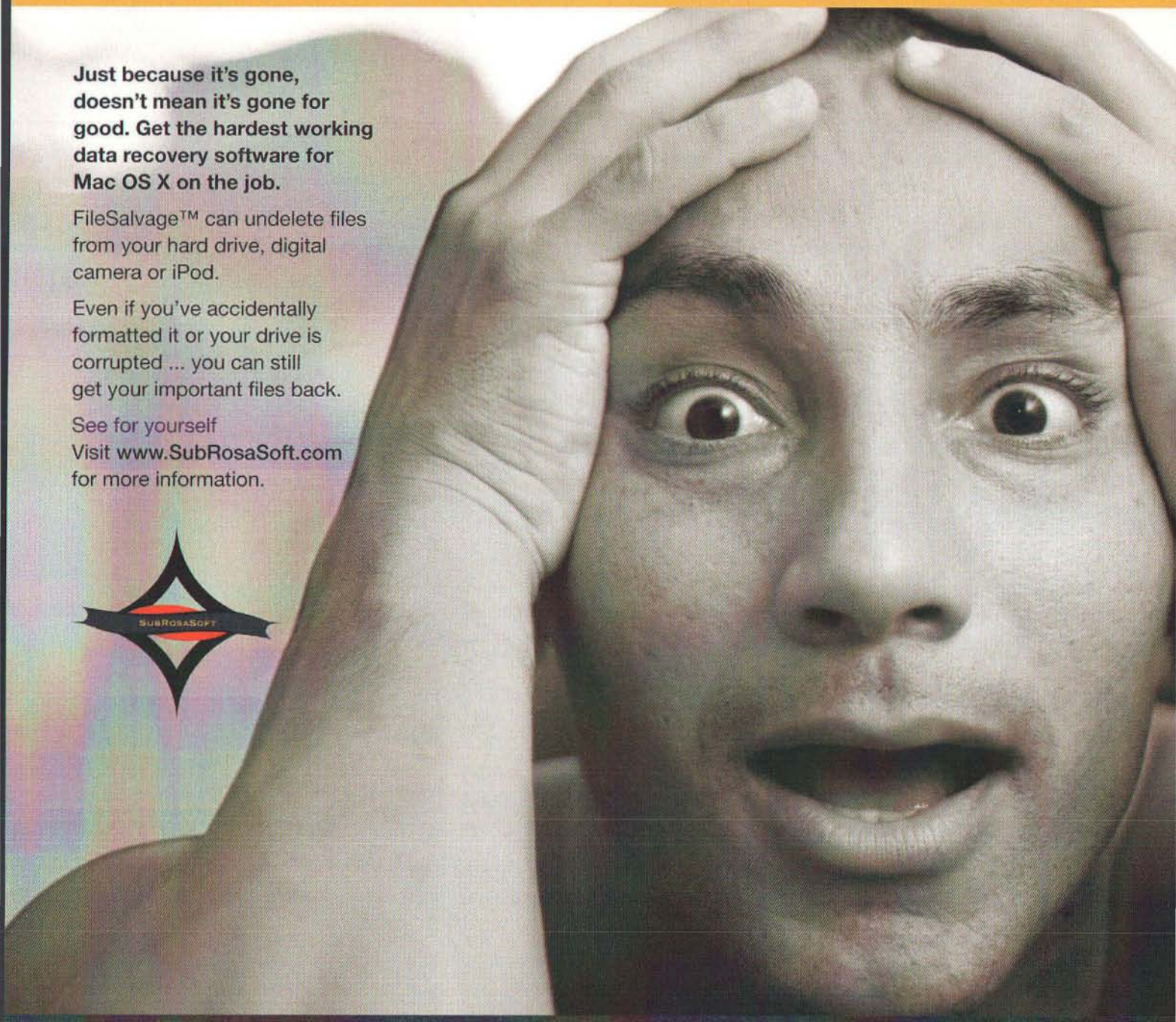


Figure 15. Swap image files when prompted

After successful installation, you'll see FreeBSD as your Guest VM.

'Poof! Three months of work gone because I hit the wrong key.'



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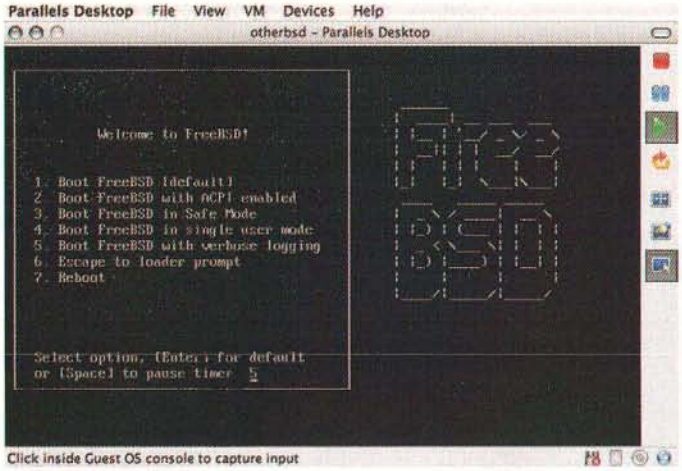

Figure 16. FreeBSD virtual machine

Post Install Euphoria and Reality Check

Windows Server 2003 ran quite fast on my MacBook Pro (2.16 GHz, 2 GB RAM) and iMac (2 GHz Intel Core Duo, 2 GB RAM). I ran SQL Server 2000, a QuickTime movie, Photoshop and various Office 2003 applications on the Guest OS while working in Fireworks, Photoshop, Entourage and Keynote on the Mac OS X Host. No delays, screen redraws or other obvious hits to performance on either Host or Guest.

Both the Windows Server 2003 and FreeBSD VMs used the virtual network adaptor without any re-configuration. Despite being the latest update release candidate (build 1884, as of this writing), there are still some USB glitches (some flash drives and Windows mobile devices were recognized, others inexplicably not; several USB drives that were recognized would not display files on the drive). This build also boasts compatibility with the quad-processor Mac Pro, completing support for the entire Intel Apple line. I had a little difficulty with networking on a new Mac Pro (two 2 GHz Intel Core Duos, 2 GB RAM) but the Parallels Forum (http://forum.parallels.com/) had workarounds posted that solved this and a few other known issues. I'm confident that improvements to support for the Mac Pro will come quickly.

Setting up printing was simple. Since I experienced some USB device issues, I took the easy route and downloaded and installed Bonjour for Windows (from <http://www.apple.com/support/downloads/bonjourforwindows103.html>), turned on printer sharing in OS X and…it just worked.

Want to back up your VM? Just copy the .hdd and .pvs files from the virtual machine directory in ~/Library/Parallels/ and you're set.

One minor inconvenience is that you can't listen to audio CDs and you can't burn discs from within VM's but I don't consider this a deal breaker.

3D graphics support is one of the most popular feature requests so keep an eye out for future updates to Parallels Desktop to accommodate the gaming set.

Despite these few minor issues and inconveniences, Parallels Desktop is well worth its low price and the benefits of dead simple installation, admirable speed, seamless networking and – most importantly – the ability to switch instantly between host OS and guest VM's without a reboot.

The Future

At WWDC in August, VMware - the leader in virtualization software - announced a Mac port available later this year. VMware's entry into the Intel Mac VM market heats up the race to provide complete VM compatibility, performance and meet feature requests. It's always nice to have a choice and it's interesting that companies like VMware, who have a global presence, are keen on providing services for the OS X platform.

Early this year, MacTech ran my article on distributed computing, and I wrote: "Of note, virtualization technology is built into Intel chips which will allow the machines to be partitioned to run different types of software like Windows or Linux at once, on top of Mac OS X. And hardware virtualization enables a system to run at near full-speed." We're there now! So what's next? Will Apple provide native virtualization in 10.5? Will you be able to create a VM through an app in Utilities or through a pref pane? The future will bring Mac users more choices and more cross-compatibility with other operating systems.

About The Author

Mary Norbury is IT Director at the Barbara Davis Center for Childhood Diabetes, an affiliate center at the University of Colorado at Denver and Health Sciences Center in Aurora, Colorado. She has extensive experience in cross-platform systems implementation and administration in the education sector. You can reach her at norburym@mac.com. (The XGrid and Tiger 10.4 article referenced is MacTech back issue Issue 22.02 and is also available in the MacTech 2006 Magazine Sampler found at ://mactech.com/sampler/)

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Spam Graphing and Logging for SpamAssassin Rule Optimization

By Paul T. Ammann

During my tenure as a systems administrator, I noticed that admins fall into two disparate groups based on how they approach a problem. The first group aggressively works toward a solution and closure to the problem, trying any potential change that might make the fix. The other group works more methodically, making calculated adjustments and reversible changes. I've come to appreciate both groups, especially the former when it's important to just "get the job done", but getting a grip on spam requires the more deterministic approach. Counting and graphing your spam, for example, can help you see just how big your problem might be and how best to attack it.

This article details how to gather statistics on mail that is filtered through SpamAssassin, and how to plot those numbers with MRTG. This project began when I decided to learn exactly how much spam I received in a given period; it grew when I found some oddities in the SpamAssassin rules that matched most frequently. I should add that when I began this project I had already invested considerable time tuning SpamAssassin's Bayesian database. In my opinion, this remains one of the strongest defenses against spam on a per-user basis, because what is spam to you is not necessarily spam to your neighbor. Thus, teaching SpamAssassin to recognize what's spam to you, is important.

On that note, you also should be aware that the implementation described is designed for a single user. The scripts could easily be edited for use at the domain level. However, the objectives here are to tune SpamAssassin, which is difficult to do, and to make global assumptions about what hundreds of users might concur is spam. The methods described increase the effectiveness of Bayes filtering by finding out which rules are triggered most often. This is done by counting incoming spam and graphing the numbers.

Two direct dependencies are used in this article's features—SpamAssassin and MRTG, both depending on Perl. Both packages can easily be installed (see References), thus their installation will not be covered here. The projects' websites contain thorough documentation as well. A potential, third dependency might be procmail, but your favorite local mail agent can be used to filter incoming mail through SpamAssassin. I like procmail, and will describe how I used it.

Getting the Statistics

The first step in implementing this spam control suite is having your incoming mail filtered through SpamAssassin before delivery. This is where I use procmail. The following line at the start of your .procmailrc file in your home directory will pipe mail through SpamAssassin:

```
:0fw
| /usr/bin/spamc
```

This use depends on having the spamd daemon running, which I highly recommend for efficiency. If, for any reason, running the daemon doesn't suit you, mail can alternatively be piped to /usr/bin/spamassassin, but this setup will spawn a different perl/spamassassin process for each mail. My home mail server runs fetchmail to get 10 mails per call.

This setup alone will do SpamAssassin's default actions and tag your mail headers, and prepend the mail's subject line with SpamAssassin's default "***SPAM***". While these tags are useful to end-users, the utilities of this article depend on the X-Spam-Flag mail header, which contains a Yes/No spam assertion and SpamAssassin's score based on its scoring rules. We'll make use of these features by asking procmail to do a few more things with our mail.

Although it might seem odd, we're going to filter the mail through SpamAssassin a second time, but this time the custom script this article features makes use of the Perl module Mail::SpamAssassin::NoAudit, which doesn't deal with the full overhead of SpamAssassin. The next release of this project will likely eliminate this duality, so check for updates. The following should appear next in .procmailrc:

```
:0c
| .spamassassin/bin/spamassassin_stats.pl
```

Also, note that the following procmail recipe was an early implementation of this tool and worked quite well, but then these responsibilities got snarfed into the above script for the sake of consolidation. It nicely creates two counter files and delivers mail to a spam mbox file and non-spam mail as usual:

```
:0
^X-Spam-Flag:.*YES.*
{
            # deliver to spam mbox file AND incr spam
counter file
            :0 c
            | echo -n . >> .spamassassin/count.spam
            :0
            mail/spam
}

:0c
| echo -n . >> .spamassassin/count.ham
```

The spamassassin_stats.pl script uses the ~/.spamassassin/stats directory to keep its count (see Listing 1). There are two files, named counts.spam and counts.ham, which tally their respective mail types. Additionally, there are two files to keep track of SpamAssassin scores (scores.spam and scores.ham), and two directories (named "spam" and "ham"). These directories hold some interesting statistics—a file named for each SpamAssassin rule matched with its size, being the count of matches. Thus, a simple **ls –lS | head** in the spam/ or ham/ subdirectories can quickly show most common characteristics in your spam. This feature alone may suit some admins who just want to quickly see some numbers, but the graphing used by MRTG really adds some nice documentation of spam abuse. Another quick option is to point your web server to this stats directory (assuming directory listings are permitted). Apache has linked column headers, which sort for that specific column. Use this to sort your stats.

Listing 1: spamassassin_stats.pl

Please visit the MacTech Source Code ftp for Listing 1.
<ftp.mactech.com/src/mactech/volume22_2006/22.11.sit>

Graphing the Stats with MRTG

As with the common use of MRTG, the mrtg binary should be run about every 20 to 30 minutes via cron, but we'll be using a custom config file named .spamassassin/stats/mrtg/spamcount.cfg (see Listing 2). This will be the only required argument to mrtg in your cron entry:

```
7/37 * * * * /usr/bin/mrtg $HOME/mrtg/spam/spamstats.cfg
```

Depending on your influx of mail, it might be beneficial to reduce this frequency to dramatize your graphs.

Listing 2: spamstats.cfg (mrtg config file)

Please visit the MacTech Source Code ftp for Listing 2.
<ftp.mactech.com/src/mactech/volume22_2006/22.11.sit>

The spamstats.cfg file can be extended to create as many graphs as you need, but the file used here just graphs incoming spam counts, and the percentage of mail that is spam. The reality of these graphs may be surprising. I was shocked and disappointed to discover that I get more than 90% spam!

If you're familiar with MRTG, you probably know it can quickly be configured to graph port traffic from your routers or switches, as it was designed to do. However, it can also be extended to graph almost anything. By default, MRTG queries a router and expects four lines in return, of which the first two are the counts of inbound and outbound bytes, and the second two are the sysUptime and sysName MIB entries. The first two lines are completely arbitrary, and can be used to represent ***anything***. The scripts called via spamstats.cfg do just this. They get the numbers via file size in the stats directory tree and return them to MRTG—almost too easy.

The initial versions of these scripts also maintained overhead, keeping track of the counter files and clearing them periodically, but as it turns out, MRTG takes care of maintaining a database, and has features to reset counters. Whether you're using RRD (Round Robin Database, a preferred logging mechanism for MRTG), or MRTG's default text database scheme, MRTG does all the work of keeping track of historical data. This is done by integrating new data into historical averages.

From the perspective of MRTG, this is all that's needed to create the Yearly, Monthly, and Weekly graphs. If more detailed historical data is desired, it can easily be maintained by a few edits to these scripts. However, the counter files do need to be periodically reset. The ThreshMaxI and ThreshProgI MRTG configuration options let us set a counter threshold and program to reset the values, respectively. Just like your switch's counter registers reset when it hits the ceiling of a 32-bit register, we'll do the same. We'll set the magic number to 1024 because a default HFS filesystem makes use of a 16K block size. This is the number to which we'll configure ThreshMaxI and ThreshMaxO to respond.

To finish the presentation, we'll use indexcfgmaker, a Perl script that's part of the MRTG distribution. We can feed this script, the spamstats.cfg MRTG config file as an argument, and it'll generate appropriate html for an index.html file containing a list of all the monitored objects in tabular format with the five-minute averages graphs. This provides a quick overview of the current status. Clicking on any graph will take you to that monitored object's full page with the Weekly, Monthy, and Yearly graphs.

Tuning SpamAssassin for Better Filtering

Now that we can "see" our spam from a higher perspective, SpamAssassin can be tuned for better filtering. The default values that SpamAssassin gives to rules are configured in /etc/mail/spamassassin/local.cf. When I first began filtering my mail with these scripts, I was surprised to see how many mails scored higher than the Bayesian 90th percentile. By increasing the weight of frequent culprits in my .spamassassin/user_prefs file, I also increased the number of mails matched above the 90th percentile. Likewise, if you find you never get any non-spam mail hitting above the 30th Bayesian percentile, you can

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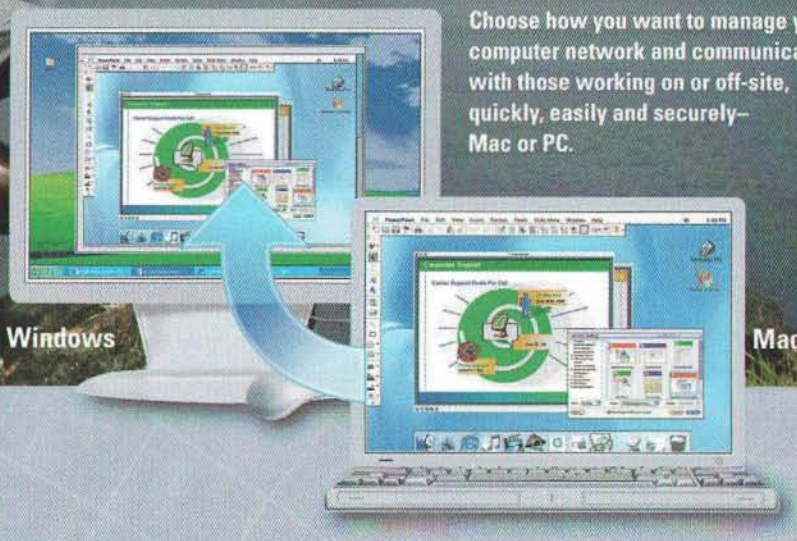

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comfortably set the Bayesian watermark to 70 instead of the default of 99. Here are some of my .spamassassin/user_prefs:

```
score adjustments
score DATE_IN_FUTURE_03_06                5.0
score INVALID_DATE                         3.5
score DOMAIN_SUBJECT                       2.5

# trigger and bayesian learning thresholds
required_hits                              3.5
auto_learn_threshold_spam                  7
```

The roots of this project began with filtering my personal mail, and I have been continually tempted to try these utilities at the server level (I haven't yet). However, it seems most anti-spam whitepapers emphasize the point that Bayesian filtering is strongest per user. Although, I would expect the graphing to be helpful at the server level, I would also anticipate that one small change to benefit one user's spam problem might create false positives for another.

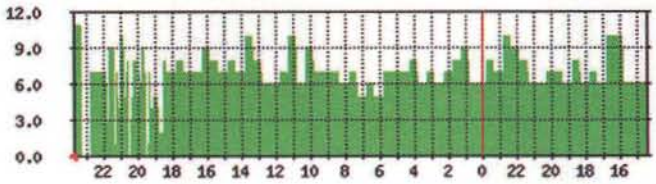

Figure 1: avg_spam_score-day

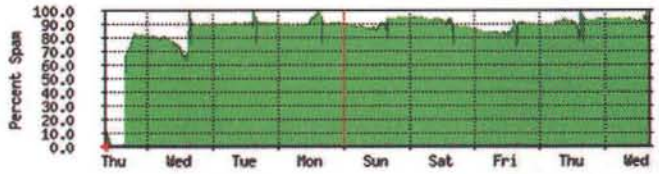

Figure 2: myhost_pct_spam-week

Conclusion

If you've been using MRTG to track router traffic, you'll likely agree as to the convenience of seeing this information graphically. Many sys admins are already overtaxed with responsibilities, thus the more utilities we have to see what our system is doing, the better. And, while most of us pride ourselves in being able to find almost any system stat from the command line, it's undeniably helpful to have graphical tools.

An extended hope of mine is that this suite of scripts can help legislation catch up with the spam epidemic. Although spam provides a lot of job security to sys admins, I think we would all prefer to see it disappear, so we could work on bigger and better things. I hope these graphs can be used to show management and politicians how badly some of us are plagued by spam and thereby losing productivity.

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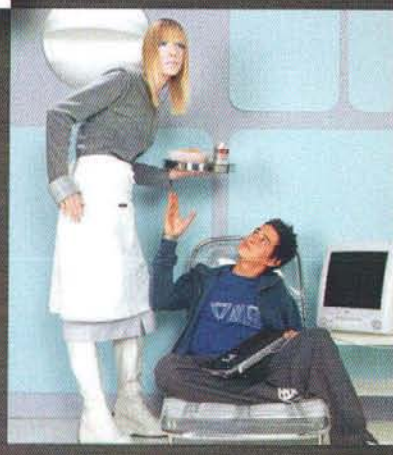

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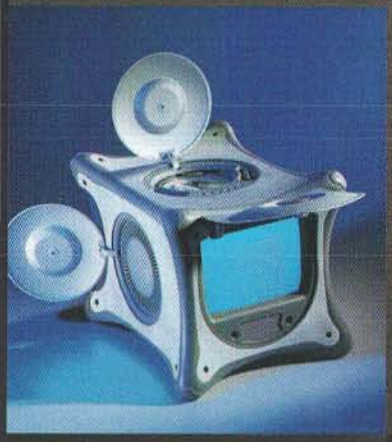

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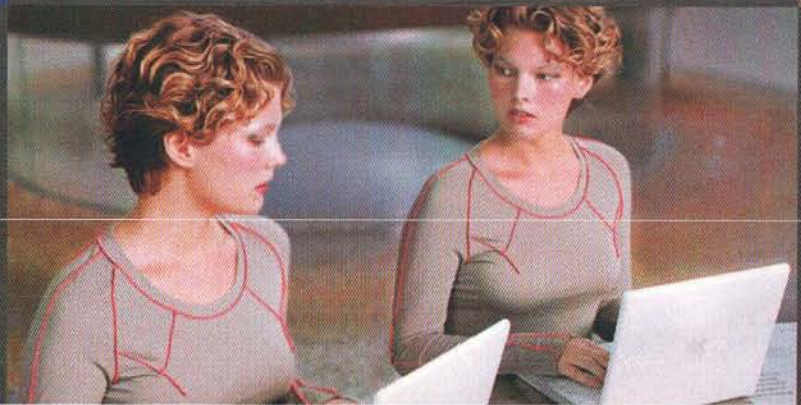

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How-to: Triple boot a Mac with Windows and Linux

By Criss Myers

Preface

Apple Mac's migration to Intel's X86 Architecture in January 2006 presented a unique opportunity that, in theory, enabled any X86 OS, be it Solaris, Unix, Linux or Windows to run on Apple Macintosh hardware. Finally the barriers between Linux, Mac and Windows were broken down as each could be run natively on the same machine, allowing a like-for-like comparison of OSes and hardware.

Architectural differences between Apple's X86 machines and other X86 machines

There are, however, a few technical issues that need to be overcome to enable a Mac Intel machine to be dual or triple booted.

Firstly, Mac uses the Intel Core Duo chip which uses Intel's advanced EFI (Extended Firmware Interface) to boot the operating system, a system already used by Intel's Itanium systems and far more advanced than the much outdated BIOS developed in the 1980s. Microsoft's Windows XP and their Future OSes such as the long awaited Vista will not use EFI for some time. In April 2006 Apple launched a Firmware update to EFI for all Mac Intel Machines that allows the EFI's in-built chooser to see Windows legacy bios boot sectors and boot them. An open source project called rEFIt can see all legacy bios sectors and identify them as either Windows or Linux and even recognize boot sectors on external drives as well. This project can be either installed onto the Mac OS partition, and blessed so that it can be the default boot partition, or burnt on to a CD and booted from there. There is also now a "Start up Item" which keeps rEFIt active across Mac OS X updates and prevents problems with Safe Sleep.

Secondly, Apple opted to use the more advanced partition table called GPT (GUID partition table) as opposed to MBR (master boot record) that most other OSes use. Windows XP, Vista and RedHat Enterprise Linux use this MBR, the problem is therefore that these OS's will not be able to read or mount the partitions if the Mac hard drive is formatted as GPT. OS X is not able to read MBR tables. From release 10.4.5, Apple's Disk Utility can format and create both MBR and GPT but not both together. Windows partition tool can only create MBR, Linux's fdisk can only create MBR and Linux's Parted (alternative partition tool) can only create GPT. Therefore a Mac machine can be formatted for single boot of OS X 10.4.5, Windows XP SP2 or a Linux/Unix distribution, but to create a GPT / MBR dual boot machine would be a problem. To solve this problem Apple updated their Disk Utility in OS 10.4.6 to create a GPT table and then mirror it to an MBR table, so that both OS's could read it. They incorporated this into their BootCamp beta, which will later be incorporated into OS 10.5 Leopard.

Apple created BootCamp to enable the installation of Windows XP on to a Mac as a dual boot setup. BootCamp firstly creates a Windows Driver CD for the particular hardware it is running from, then it allows the user to partition the Mac hard drive into 2 partitions without reformatting the drive (via a GUI to the command line diskutil). It then reboots the Mac from the Windows XP SP2 disk. BootCamp can also restore the drive to a single partition again.

A Mac machine cannot be dual or triple booted straight out of the box. Some of these technical issues, however, have been solved by Apple in response to the customers desires to dual boot their Macs. There are also a few Linux distros that have been adapted to work on Mac Intel, such as Debian and Ubuntu. However until the next version of RedHat Enterprise Linux is released there is no current version adapted for Mac Intel.

So to dual boot a Mac for OSX Tiger and Windows XP is easy, Apple has done all the work and created all the tools to do it, the problem comes when you need to triple boot.

There are plenty of resources online to guide you through dual booting a Mac with OSX and Windows XP, Apples BootCamp section of their site has lots of information.

<http://www.onmac.net>
<http://www.maconintel.com>
<http://http://fedoraproject.org/wiki/FedoraOnMactel>

All of these have information on dual booting a Mac, but very limited information on triple booting.

As pointed out by the fedora project:

"Right now, we've only tested Dual Booting with OS X. If you want to Triple Boot, you're going to have to do some investigation on your own."

There follows a step-by-step guide to triple booting a Mac Intel with any distribution of Linux.

```
if (your_website_stats == ???) {
    try_visistat = free;
    setup = no_brainer;
    web_stats = !!!;
}
else {
    no_clue = true;
}

//REAL-TIME WEBSITE TRACKING
goto = www.visistat.com;
```

Hardware and Software Required

Here are the items we need to accomplish this:

- Mac Intel machine, any model.
- OS X 10.4.5 Intel Install DVD that came with the machine.
- Firmware Update, for your particular hardware, NOT the SMC update (check your firmware - <http://docs.info.apple.com/article.html?artnum=303880 >)
- Keyboard Update for Mac Intel, released 04/27/2006.
- OS X 10.4.6 Intel ComboUpdate, released 04/03/2006.
- BootCamp Beta 1.1
- Windows XP Service Pack 2 Install CD
- Linux - RedHat Enterprise Linux V4 update 3 Install CD's 1-4
- Ubuntu LiveCD for Mac Intel, this has built-in drivers for USB devices (<http://sourceforge.net/project/showfiles.php?group_id=160126&package_id=181927>)
- rEFI Toolkit, (http://refit.sourceforge.net/) 0.7 ISO version.
- USB Pen drive
- USB Hard drive, DOS formatted

This guide presumes that the reader will have a basic knowledge of Linux, the command line, and how to boot from non Mac install CDs.

Step 1: Preparation

Install 10.4.5 that came with the Mac, connect it to the internet and download the following from the above links :

Firmware update for your particular model. NOT the SMC update.

- Keyboard update 1.0
- 10.4.6 Intel Combo Update
- BootCamp Beta 1.1

Download the following files and them burn to CDs:

- Ubuntu LiveCD
- Linux – I am using RedHat Enterprise Linux 4, Disks 1-4
- rEFI Tools 0.7 ISO

From the Linux install disk 4, copy lilo.rpm to the USB pen drive.

Install any required firmware update, then install 10.4.6, do not install 10.4.7 otherwise you will not be able to install the Keyboard Update. Install the Keyboard Update, which will prevent the Keyboard from being unresponsive when booted from the Linux CDs.

We will now create an XP Drivers CD. To do this, install BootCamp beta and then create the drivers CD for your particular hardware from the BootCamp menu. If BootCamp doesn't recognize your Firmware update, Apple suggests you install 10.4.7 Combo or reinstall BootCamp.

Step 2: Creating a working Linux system

We are now ready to begin the triple boot process. Even though we can partition the drive into 3 partitions we cannot install Linux directly onto the second partition. This is due to the fact that when we partition the drive it will create a GPT record and an MBR mirrored record. Windows XP will simply ignore the GPT record as it has no understanding of what a GPT record is. RedHat Linux's installer Anaconda, however, is more sophisticated and will recognize the GPT record, but because it cannot install onto a GPT drive it will then try and reformat the drive. This maybe a problem with many other distributions of Linux and Unix. As we know that the only formatting tool that can support both MBR and GPT together is Apple's diskutil we have to format the drive under OS X. We will work around this problem as follows.

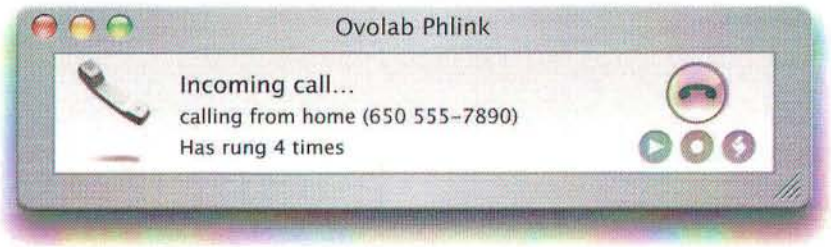
Boot the Mac from the Linux install CD1 and when asked to partition the drive do so manually and create a single root "/" partition with the same size as that which you intend to use for your final setup. I am using an 80GB hard drive so I will use 15GB for Windows, 15GB for Linux and the remaining for OSX, this means I will create a 15GB root partition which will be called sda1 (Mac Intels use Serial IDE drives so they get the names sda1, sda2 etc rather than hda1.) Do not create any logical volumes or swap partitions.

When prompted, do not install any boot loader, as we cannot use GRUB on Mac Intels: it will hang at Stage 2 of the boot process. LILO is the only boot loader that works. LILO is not a default option under RedHat's Anaconda, and therefore, we will install the bootloader later. If your distribution of Linux allows you to install LILO then install it on to the root partition not the MBR, finish the installation and skip the next part and go straight to rebooting from the rEFIt disk.

Install the rest of Linux to your requirements as per normal.

We will now install LILO. Boot the Mac from the Ubuntu LiveCD, connect the USB pen and copy lilo.rpm from the USB

When a stranger calls.



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pen drive (sdb1) to the Linux partition sda1. Reboot from the Linux install CD and enter the rescue mode, chroot to /mnt/sysimage, then install the LILO RPM. Reboot again from the Ubuntu LiveCD, mount the Linux partition /dev/sda1 as mnt/linux and create the following LILO configuration file in /mnt/linux/etc/lilo.conf :

```
boot=/dev/sda1
map=/mnt/linux/boot/map
install=/mnt/linux/boot/boot.b
default=Linux
LBA32

image=/mnt/linux/boot/vmlinuz-2.6.9-34.EL
initrd=/mnt/linux/boot/initrd-2.6.9-34.EL.img
label=Linux
root=/dev/sda1
read-only
```

Install LILO with the following command :

```
/mnt/linux/sbin/lilo -C /mnt/linux/etc/lilo.conf  -v
```

You should get confirmation of the LILO install without any errors.

For RedHat Enterprise users, change the fstab file in /etc , the first part of the first line should be changed from:

```
LABEL=/
```

To:

```
/dev/sda1/
```

Reboot the Mac from the rEFIt boot CD and you should now get the Linux partition as a boot option.

We now have a single boot Linux Mac, we will transfer this data onto an external drive for later use.

Boot the Mac from the Ubuntu LiveCD, mount an external DOS formatted USB drive. Copy the raw data from the Linux partition to this drive as follows :

```
dd if=/dev/sda1 of=/dev/sdb bs=512
```

This will take sometime. Many, many long hours, so go make a coffee.

Step 3: Install OSX and Partition the drive

Reinstall OSX from the install DVD that came with the Mac as per normal, creating 1 standard partition. Connect to the internet and run software update to install all the latest updates, this will install 10.4.7.

GPT supports up to 128 partitions, but MBR can only support 4 primary partitions, and GPT cannot read extended / logical partitions. Windows XP wants to install only on to C:\ which is the last partition, and the first partition will be the EFI boot partition, therefore there are only 2 left, 1 for OS X and 1 for Linux, thus you cannot create a Linux swap partition. This should not be a real problem.

Boot camp can only make 2 partitions, so we need to run the diskutil command via terminal to create the new partitions.

The following command will repartition an 80GB hard drive (disk0s2) into 15GB for Windows, 15GB for Linux and the remainder for OS X.

```
diskutil resizeVolume disk0s2 44.2G Linux RedHat-EL 15G MS-
DOS WindowsXP 15G
```

Step 4: Install Windows XP

Boot from the Windows XP Service Pack 2 Install CD. Install Windows XP as usual on to C:/ (the fourth partition). Apple recommends that you format as Fat32 rather than NTFS but I have had problems with both formats. If you format as NTFS you will not be able to write to this drive from within OS X.

Reboot into Windows XP, insert the drivers CD and install, then most of the hardware will work under XP. You now have a dual boot Mac.

Step 5: Install Linux

Boot from the Ubuntu LiveCD, mount the USB external hard drive and copy the Linux system back to the third partition, sda3,as follows :

```
dd if=/dev/sdb of=/dev/sda3 bs=512
```

Once transferred we will need to make minor changes to the LILO bootloader and the file system table fstab, so that we can load Linux from sda3 rather than sda1 as previously.

1. Edit the fstab file and change sda1 to sda3.

2. Edit the LILO configuration and change sda1 to sda3.

3. Install the new LILO configuration with the following command :

4. /mnt/linux/sbin/lilo -c /mnt/linux/etc/lilo.conf -v

5. Reboot from the rEFIt CD, select the Linux partition and it should load normally.

You now have a working triple boot Mac running OS X 10.4.7, Windows XP SP2 and RedHat Enterprise Linux 4. These will all run normally as if they were running from any standard X86 hardware. You can either boot using the rEFIt CD or you can install it onto the Tiger partition. Then each time you boot you can select the appropriate OS, or wait for it to time out and boot into OS X.

Conclusion

In this guide we installed RedHat Enterprise Linux but the same process should work for any version of Linux booted via LILO, the same should also work for Solairs and Unix but may need tweaking to resolve the change in bootup from sda1 to sda3.

About The Author

Criss Myers is a Senior Mac IT Technician for the Faculty of Science and Technology, at the University of Central Lancashire, Preston, United Kingdom. He has been a Systems Server Administrator from the very first version of OS X Server. He Works with Macs as well as Linux, Unix and Windows.

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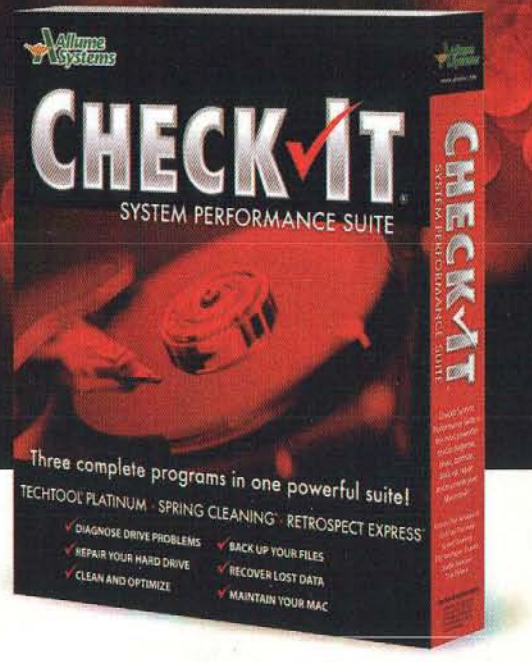

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Subversion and XCode

Source control management on XCode using Subversion.

By Jose R.C. Cruz

Introduction

Since its release, the MacOS X platform uses CVS as its default source control management (SCM) system. This tool is used for tracking changes made to a project as well as for coordinating efforts and contributions from other users. It is not, however, without its shortcomings. Its inability to handle non-ASCII files and lack of support for binary formats has been a source of frustration for many users. Furthermore, some actions such as reversions and conflict resolutions are less than adequately implemented in CVS.

To address these limitations, the open-source community developed Subversion. This article will serve as a concise introduction to the new tool. It will detail how the tool improves upon CVS as well as provide an overview of its repository structure. It will demonstrate how to use the tool to perform basic SCM operations using the tool as well as how it integrates with the XCode development environment.

Readers are expected to have a working knowledge of XCode as well as the Terminal application. Also, most examples will use `bash` as the default shell and the CurrencyConverter tutorial as the default project.

The Subversion Tool

The Subversion project

The Subversion (**svn**) project is an open-source project focused on developing a viable replacement for the CVS tool. It shares the same key developers as CVS, and has its official source repository maintained by CollabNet, Inc.

At the time of this writing, sources for the latest development version (1.3.2) are available as a downloadable tarball file at <`subversion.tigris.org`>. The latest stable version of the tool (1.3.1) is also available at the same site. The site also provides links to binary installers for various platforms, including OS X. Both binaries and sources are distributed to the public under an Apache/BSD compatible license.

The Subversion Advantage

Subversion provides numerous advantages over CVS. The most notable one is that all project files, regardless of format, are now stored into the repository as binary files. Also, project subdirectories are treated as valid repository items. They can be added, copied, deleted, and renamed like any other project file.

Subversion uses a space-efficient binary diff algorithm to store its repository items. This allows the repository to support multimedia files without causing it to grow to an unwieldy size. Also, all committal transactions are now handled atomically. This ensures that each transaction is allowed to complete without interruption, and protects the repository from corruption caused by simultaneous write accesses.

Finally, Subversion provides a much better complement of subcommands for invoking various SCM transactions. Some subcommands such as add, commit, and export behave similarly to their CVS counterparts. Others such as status, move, and revert are used to perform the same operations that would otherwise require multiple steps or command options on CVS.

Installing Subversion on OS X

The only notable disadvantage of Subversion is that it is not bundled with any versions of MacOS X. This is easily resolved, however, by first downloading the disk image file for version 1.3.1 at <http://metissian.com/projects/macosx/subversion>. Make sure to download only the client version of the tool

Double-click on the `.dmg` file to mount the image on the Finder. Locate the `SubversionClient-1.30.pkg` package and double-click on it to start the installation process. Follow the ensuing instructions to complete installation.

The installer package will place the Subversion tools and support files in the `/usr/local` directory. In order to use the tools, the PATH environment needs to be updated in order for the shell to know their locations. Use your favorite text editor to add the following lines to the hidden `.bash_profile` file on your home directory.

```
PATH=usr/local/man:/usr/local/share:$PATH
export PATH=/usr/local/bin:/usr/local/lib:$PATH
```

To test to see if Subversion is correctly installed, type `svn –help` at the Terminal prompt. Subversion should display its version and a list of all available subcommands.

The Subversion Repository

Creating the repository

Like CVS, you will have to create an empty repository wherein which to store your project archive. First add the following line to the `.bash_profile` file using your favorite text editor.

```
export SVNROOT=path_to_your_repository
```

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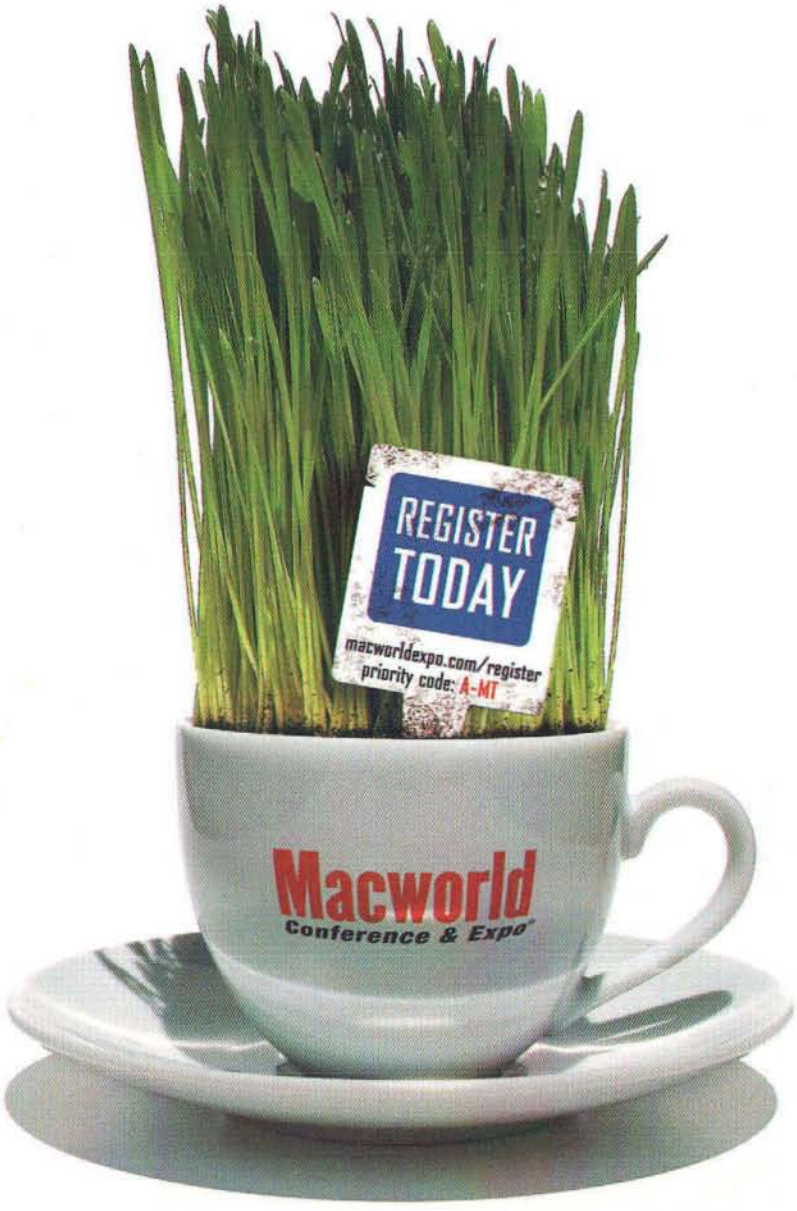

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Then type `svnadmin create $SVNROOT` at the Terminal prompt to create the repository.

For example, to create Subversion repository to be located at `/Users/Shared/SVN`, the entry for the `.bash_profile` file should read as

```
export SVNROOT=/Users/Shared/SVN
```

Then, by typing `svnadmin $SVNROOT` creates an empty repository at the specified location. If the `SVN` subdirectory does not exist, the `svnadmin` tool creates one at the specified path. However, if the enclosing directory `/Users/Shared` does not exists as well, the tool will instead generate an error.

Unlike CVS, Subversion does not maintain a default repository path. In fact, it allows you to access multiple repositories at a time. The `SVNROOT` shell variable introduced here helps reduce the amount of typing necessary to invoke a Subversion subcommand.

Figure 1 shows the directory structure of the newly created repository. It consists of a number of configuration files and scripts, as well as eight subdirectories. The only one of interest in this article is the `db` subdirectory. For a detailed description of the other repository items, read Chapter 5 of the Subversion user manual.

The `db` subdirectory is where Subversion maintains your project archives. It contains three subdirectories as well as additional support files. Each project archive revision is stored in the `revs` subdirectory. Properties for each archive are stored in the `revprops` subdirectory. The `transactions` subdirectory is used to contain files required by an SCM transaction. Those same files are then removed when that transaction completes itself.

By default, Subversion uses **Berkeley DB** as the format for its repository database. Interestingly enough, the MacOS X version uses **FSFS**, also known as *The [Versioned] Filesystem*, as its database format. This format has the advantage of being platform agnostic and multi-user friendly. It also provides better I/O performance by taking advantage of the underlying native filesystem. Furthermore, it allows the repository to be accessible over a network connection.

For more information on the two repository formats, read Chapter 5 of the user manual.

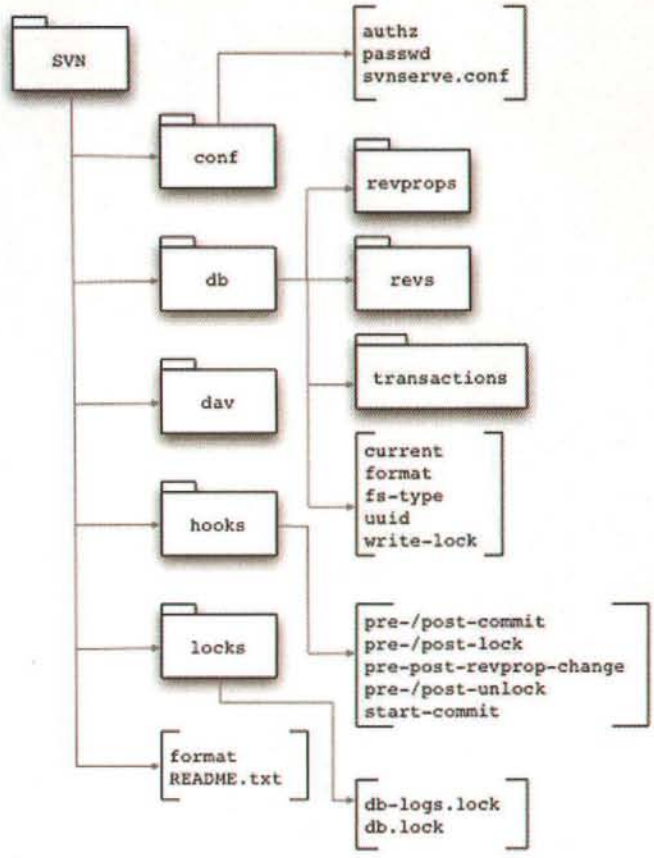

Figure 1. The SVN Repository.

Adding a project

Before adding a project to the repository, make sure to arrange its directory contents as shown in Figure 2. The `trunk` subdirectory will contain those files representing the main development line of the project. This is where you will have your images, plists, nibs, source, and header files, as well as the subdirectories used to organize those files. The `branches` subdirectory is where Subversion stores the branches created for each file. Branches that were unaltered and destroyed are stored in the `tags` subdirectory.

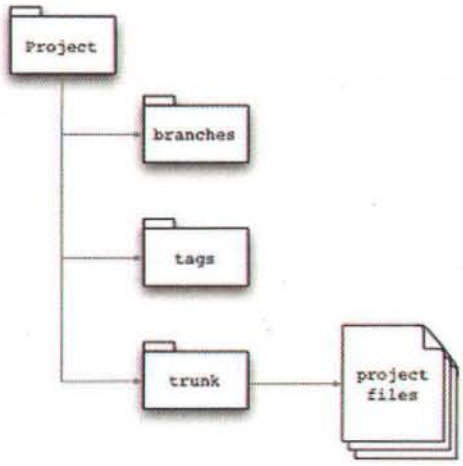

Figure 2. The recommended SVN project layout.

This directory structure is recommended only if you are maintaining a central repository to store your project archives. If you are maintaining separate repositories for each project, then you may choose not to adopt this structure.

To add a project to the repository, type

```
svn import project_directory_name file://$SVNROOT/project_name \
    -m "project_import_message"
```

at the Terminal prompt. Notice that the repository path is first preceded by the URL token `file://`. This indicates the repository is located in the ***same physical machine*** as the project. If the repository were located over a network, its path would then be preceded by either an `http://` or `svn://` token. For more information on how to setup a network repository, consult Chapter 6 of the user manual.

For example, to add the CurrencyConverter project to the repository, first navigate to the directory containing the project using the Terminal application. Then type

```
svn import CurrencyConverter
file://$SVNROOT/CurrencyConverter \
    -m "Adding the Currency Converter tutorial demo"
```

at the prompt. To check if the project was successfully added to the repository, type

```
svnlook tree $SVNROOT
```

at the prompt. Subversion responds by displaying the tree structure of each archived projects (Listing 1), one of which belongs to CurrencyConverter.

Listing 1. Sample Subversion tree structure.

```
/
 CurrencyConverter/
  trunk/
   main.m
   ConverterController.h
   Converter.m
   currCnvrt.pbproj/
    aUser.pbxuser
    project.pbxproj
   ConverterController.m
   Converter.h
   English.lproj/
    InfoPlist.strings
    MainMenu.nib/
     objects.nib
     info.nib
     keyedobjects.nib
     classes.nib
    MainMenu~.nib/
     objects.nib
     info.nib
     keyedobjects.nib
     classes.nib
  branches/
  tags/
```

Now to remove a project from the repository, type

```
svn delete file://$SVNROOT/project_name -m "reasons_for_removal"
```

at the Terminal prompt. Subversion will then quietly delete all references to the project from its repository. Also, typing `svnlook tree $SVNROOT` will show that the project is no longer "available". Since deletion also invokes an immediate committal, make sure to provide an appropriate message for the revision log. Otherwise, Subversion will not process the deletion request.

Unlike in CVS, the `svn delete` subcommand only removes the latest or head revision of the project. Previous revisions of the project are still present in the repository and are accessible for checkouts. The only way to completely remove the project is to create a replacement repository and restore it from the last backup file created before that project was added.

Backing up the repository

One Subversion feature that was not mentioned earlier is its ability to create repository backups. Equally important, it can create these backups without having to take the entire repository offline.

One way to backup the repository is to type

```
svnadmin hotcopy $SVNROOT backup_directory_path
```

at the Terminal prompt. Subversion will copy the entire repository located at `SVNROOT` and place it at the specified directory. For example, typing `svnadmin hotcopy $SVNROOT /Users/Public/Backup` creates the backup copy at `/Users/Public/Backup`. Make sure the backup directory exists; otherwise, Subversion will generate an error.

Another way to backup the repository is to type

```
svnadmin dump $SVNROOT > backup_file
```

at the Terminal prompt. Here, Subversion stores the entire contents of its repository into `backup_file`. The format used by the file is portable and platform agnostic, making it a suitable way of moving the repository from one filesystem to another. You can also create incremental backups by typing

```
svnadmin dump $SVNROOT -incremental > backup_file
```

at the prompt. The option `-incremental` tells Subversion to retrieve only those changes added to the repository since the last complete `svnadmin dump`. The resulting backup file will be smaller as a result.

Restoring from a backup is equally straightforward. If `svnadmin hotcopy` is used to create the backup, the same subcommand can be used to do the restore by switching the positions of SVNROOT and the backup directory path as follows

```
svnadmin hotcopy backup_directory_path $SVNROOT
```

Make sure to take the old repository offline and delete it before replacing it with the backup copy.

If you used `svnadmin dump` to backup the repository, type

```
svnadmin load $SVNROOT < backup_file
```

at the Terminal prompt to restore the repository from `backup_file`. If incremental backups were made, make sure to restore each backup file in the ***same order*** that they were created. For example, if you backed up your repository as follows:

```
svnadmin dump $SVNROOT > 20060601.bak
svnadmin dump $SVNROOT -incremental > 20060610.bak
svnadmin dump $SVNROOT -incremental > 20060620.bak
```

you should restore your repository in the following sequence to avoid data corruption.

```
svnadmin load $SVNROOT < 20060601.bak
svnadmin load $SVNROOT < 20060610.bak
svnadmin load $SVNROOT < 20060620.bak
```

The Subversion Work Cycle

Figure 3 illustrates a basic Subversion work cycle. Subcommands that are marked in red represent those SCM transactions supported by the XCode environment. The rest should be invoked within the project directory through a Terminal session. They could also be invoked through the XCode Script menu. More on Subversion menu scripts will be discussed later on.

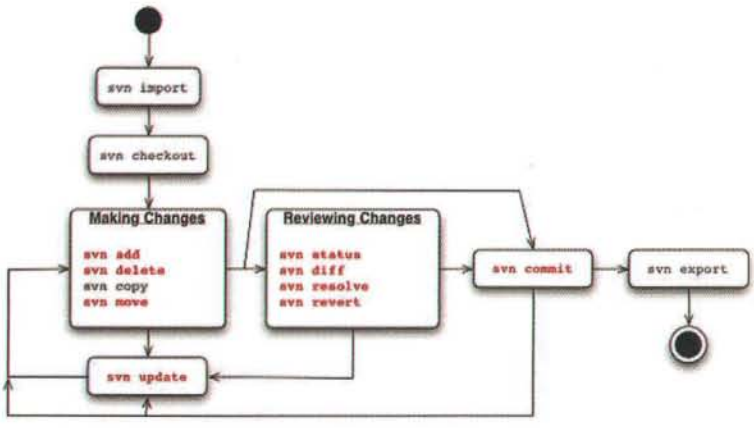

Figure 3. The Subversion work cycle.

Checking out a project

Like CVS, you first have to check out a copy of a project from the repository in order to work on it. To check out a working copy, type

```
svn checkout file://$SVNROOT/project_name
destination_directory
```

at the Terminal prompt. Subversion will list each project file and subdirectory that was checked out, and places them at the specified directory. For example, typing

```
svn checkout file://$SVNROOT/CurrencyConverter
~/CurrencyConverter
```

places the CurrencyConverter project in the home directory.

Interestingly enough, Subversion does not provide the equivalent of a `cvs release` subcommand. Once you are done with your working copy, the only viable way of releasing it, is to manually delete your copy.

Updating the project

Like CVS, Subversion allows a team of users to work on the same project. If you are part of a team, you should always update your copy of the project on a regular basis. This allows you to catch and resolve any potential conflicts between your changes and theirs.

To update your working copy to the ***latest*** revision of the project, type `svn update` at the Terminal prompt. To update it to a ***specific*** revision, type `svn update -r revision_number` at the prompt.

For example, if John Doe has submitted his revision of the source file, `Converter.m`, first use the Terminal prompt to navigate to your copy of CurrencyConverter. Then type `svn update` at the prompt to update your copy of `Converter.m` to the new revision.

Consequently, if you want to find out which project files have been recently changed, type `svn status project_name` at the Terminal prompt. Subversion then generates a list of files and subdirectories with their current repository state. To display additional status information, type `svn status -v project_name` at the prompt.

If Subversion detects any conflicts between your working copy and the project archive, it generates three different files containing the conflicting changes. The `.mine` file contains those changes you have made on your working copy. The `.rold_revision` is the revision of that file from the archive before you made your changes. The `.rnew_revision` is the revision of same file from the archive while you were making your changes. Like in CVS, you manually examine each file and attempt to resolve the conflict manually. After you have resolved the conflict, type `svn resolved project_file_name` at the Terminal prompt to clear the conflict flag. Otherwise, Subversion will not allow you to commit your changes back into the repository.

For example, if your copy of `Converter.m` file, checked out at revision 3, conflicts with the latest revision (4) in the archive, Subversion generates the following three files:

```
Converter.mine  Converter.r3  Converter.r4
```

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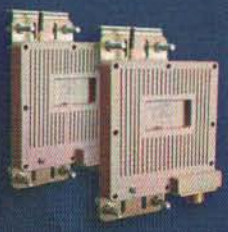

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Use your favorite text editor to manually examine and merge the conflicting changes. Once done, type `svn resolved Converter.m` at the prompt to clear the conflict flag.

Manipulating project items

Subversion allows you to easily add a new project item, like a file or subdirectory, to the repository archive. Furthermore, if the item happens to be a subdirectory containing additional items, Subversion will also add those items as well.

To add a new item to the repository, type `svn add` *`project_item_name`* at the Terminal prompt. For example, if a `CurrencyConverter.icns` file has been added to the CurrencyConverter project, type `svn add CurrencyConverter.icns` to add that file to the repository archive. Also, if the project bundle, `CurrrencyConverter.proj`, was converted to the new XCode 2.2 format, thus changing its extension to `.xcodeproj`, type `svn add CurrencyConverter.xcodeproj` at the prompt. Since a bundle is essentially a specialized subdirectory, Subversion will add the subdirectory, including the three files it contains, to the archive.

Subversion also makes it easier to copy, move, and delete existing project items, and then submit those changes back to the repository archive. To create a copy of an existing file or subdirectory, type `svn copy` *`project_item_name new_name`* at the Terminal prompt. To move (or rename) the file or subdirectory, type `svn move` *`project_item_name new_name`* at the prompt. To delete it, type `svn delete` *`project_item_name`*.

Subversion handles all four requests by first queuing them into its transaction queue. Then, on the next committal transaction, it executes each request in the order they were submitted. In the case of a copy, move or delete transaction, Subversion will perform the operation on the working copy of the project as well.

Committing and discarding changes

As in CVS, committing changes made to the project back into the Subversion repository is a straightforward process. Simply type

```
svn commit project_item_path -m "reasons_for_committal"
```

at the Terminal prompt. Alternatively, to commit all changes made to the project type

```
svn commit project_name -m "reasons_for_committal"
```

at the prompt. For example, to commit the changes made to the file, `Converter.m`, type

```
svn commit Converter.m -m "reasons_for_committal"
```

To commit all changes made to CurrencyConverter, type

```
svn commit CurrencyConverter -m "reasons_for_committal"
```

Always provide a brief and concise committal message to ensure an accurate revision history.

Subversion first checks the repository for any committal transactions in progress. If none are present, it locks the repository to prevent future committals from other users. It then processes your committal request and unlocks the repository after a successful or rejected committal. In case your committal transaction fails, avoid further attempts in order to protect repository integrity. Contact your project administrator to resolve the issue.

Discarding changes made to a project item is also equally straightforward. Type `svn revert` *`project_item_name`* at Terminal prompt to revert to the ***latest*** revision of the item in the repository. To revert to a ***specific revision*** of the same item, type

```
svn revert -r revision_number project_item_name
```

at the prompt.

Exporting the project

Finally, Subversion allows you to export a copy of your project archive for public distribution. Like in CVS, the exported copy does not contain any administrative files, thus preventing it from being accidentally committed back into the repository. Also, Subversion streamlines the process by not requiring a release tag assigned to the project to be exported. Instead, it will export a specified revision of the project archive or, if none is specified, the latest revision of said archive.

To export a copy of the project archive, type

```
svn export file://$SVNROOT/project_name export_directory_path
```

at the Terminal prompt. To export a specific revision of the archive, type

```
svn export -r revision_number file://$SVNROOT/project_name \
      export_directory_path
```

at the prompt. For example, if you want to export the latest revision of CurrencyConverter, type

```
svn export file://$SVNROOT/CurrencyConverter \
      ~/Projects/CurrencyConverter_GM
```

to export the project under the name `CurrencyConverter_GM` and in the `Projects` subdirectory of your home directory.

It is recommended that you assign a different name to your exported project. However, if you use the same name as the project archive, make sure to export the project to a different directory. This is to avoid the export process from accidentally overwriting your working copy of the archive.

Subversion and XCode

Since both CVS and Subversion share some of the same subcommands, XCode is capable of supporting either one through its SCM menu. However, many of the SCM operations supported by XCode are geared more towards CVS, being the default tool. But, with some work on your part, you can configure XCode to take advantage of many Subversion features.

Enabling Subversion support

To start managing your XCode project using Subversion, add your project to the repository and check out a working copy

using the procedures stated earlier. Open the project into XCode and choose Edit Project Settings from the Project menu to display the Project Info panel. Select Subversion from the drop-down list labeled SCM System. Click on the Edit button to change the current Subversion tool path from `/usr/local/subversion/bin/svn` to `/usr/local/bin/svn` (Figure 4). If you skip this step, XCode will display an error informing you that it is unable to locate the Subversion tool. Once you have set the correct tool path, click on the Enable SCM checkbox to set it.

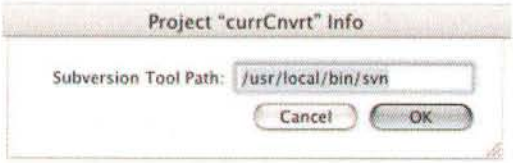


Figure 4. Changing the SCM tool path.

There is nothing wrong with the default tool path of `/usr/local/subversion/bin/svn` if you happen to have installed Subversion at that particular location. However, the current Subversion installer uses `/usr/local/bin` as its installation directory, hence the procedure. This could change in future distributions so make sure to read the accompanying release notes before installing or upgrading your copy of Subversion.

The Subversion work cycle in XCode

As mentioned earlier, XCode uses the SCM menu to handle the Subversion work cycle. Each menu item performs the selected transaction by invoking the appropriate Subversion subcommand, many of which are shown in Table 1. Most of the subcommands invoked work on the latest revision of the project archive or its items. Those that work on specific revisions will prompt you for the revision number through an input dialog.

Menu Item	Subcommand
SCM Results	svn status
Add to Repository	svn add
Resolved	svn resolved
Commit Changes...	svn commit project_item_name -m message
Discard Changes	svn revert
Update To	svn update -r
Diff With	svn diff -r
Get Annotations For	svn blame -r
Commit Entire Project	svn commit project_name -m message
Update Entire Project	svn update project_name

zTable 1. The SCM menu items and their SVN subcommands.

Other menu items will also generate the Subversion subcommand corresponding to the selected operation. For instance, choosing **Rename** from the **File** menu to rename a project file generates an `svn move` to rename the same file in the repository archive. Choosing Delete from the Edit menu to remove a project file (***both references and item***), generates an `svn delete`, thus removing the file from the archive.

The **Info** panel (Figure 5) can also generate the appropriate Subversion subcommands by clicking one of the four buttons on the panel. Each command uses the currently selected project file or the project bundle as its input argument.

The **Update** button generates an `svn log`, which displays the log report for the selected item. The **Compare** button generates an `svn export` to temporarily retrieve the item from the archive. It then launches FileMerge and uses it to compare the contents of the exported item with that from the project. The **Diff** button generates an `svn diff` showing the differences between the selected item and its archival version. Finally, the **Annotate** button generates an `svn blame`, displaying the revision and author history of the selected item.

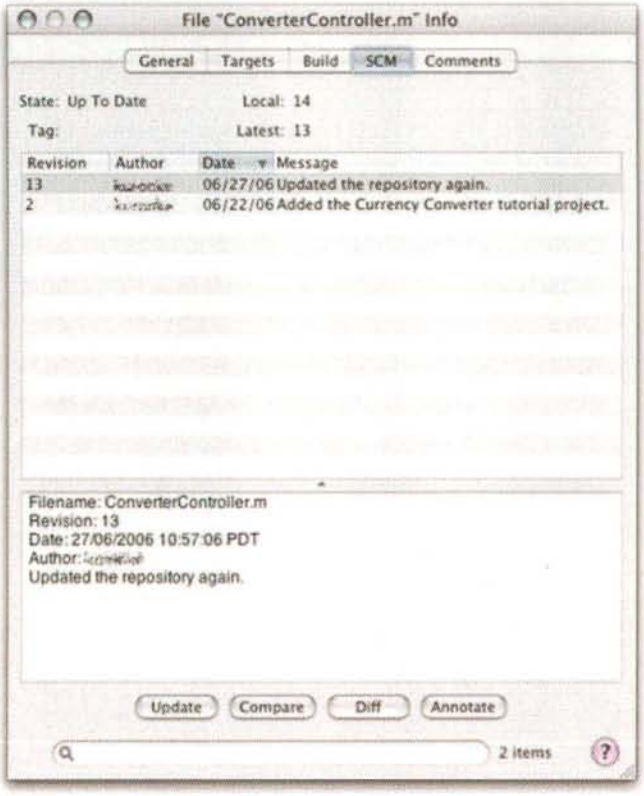


Figure 5. The SCM view of the Info panel.

Subversion menu scripts

Unfortunately, the built-in SCM support in XCode is limited and certainly not customizable. Future versions of XCode might address this limitation by redesigning its SCM support as a collection of customizable plug-ins. Each SCM plug-in would then correspond to a specific system such as Subversion, and would allow developers to fine-tune each transaction in a fashion similar to key bindings.

Until than happens, the only way to implement customized SCM transactions is through the XCode **Script** menu. This menu supports scripts that are written in most shell languages such bash, Python, and Perl. It does not, however, supports scripts written entirely in AppleScript nor JavaScript.

All XCode menu scripts are stored in the directory

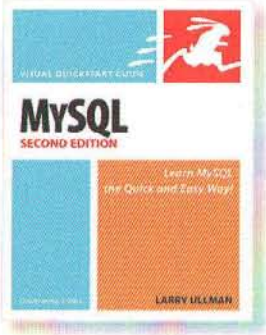
```
/Library/Application Support/Apple/Developer Tools
    /Scripts/10-User Scripts
```

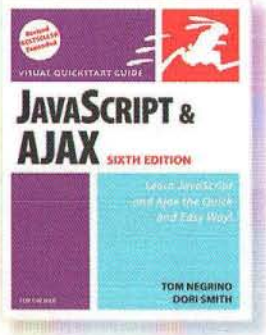
The scripts are grouped into separate subdirectories, each one corresponding to a category. For instance, the SCM menu scripts featured here are stored in the subdirectory named **Subversion**.

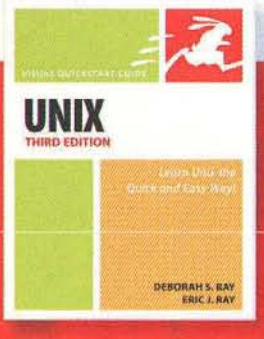
Listing 2 shows one example of a Subversion menu script. This script first checks the `trunk` directory of the project for the hidden subdirectory `.svn`. It then extracts the repository path and project name from the `entries` file stored in the hidden subdirectory. Afterwards, the script invokes the `svnlook tree` subcommand and stores the results into the file, `svnlook_tree.log`. It then uses XCode to display the contents of the log file. A variation of this script is also used to invoke the `svnlook history` subcommand.

Listing 2. Displaying the repository tree.

```
#! /bin/bash
#
# Script:       svnlook_tree.sh
# Description:  Display the tree structure of the project in
#               the Subversion repository
#
# — PB User Script Info —
# %%%{PBXName=Show SVN Tree}%%%
# %%%{PBXInput=None}%%%
# %%%{PBXOutput=SeparateWindow}%%%
#
# update the following environmental variable
export PATH=/usr/local/bin:/usr/local/lib:$PATH

#prepare the following shell variables
SVNTAG="repos="
SVNURL="url="
SVNDIR="build/svn"
SVNLOG="$SVNDIR/svnlook_tree.log"
SVNERR="$SVNDIR/svnlook_tree.err"

#check for the following hidden directory
if [ -d ".svn" ];
then
   #retrieve the repository key
   SVNGREP=`grep $SVNTAG .svn/entries`

   #retrieve the repository location
   SVNROOT=`echo $SVNGREP | awk -F= '{ print $2 }'`
   SVNROOT=`echo $SVNROOT | awk -F"\"" '{ print $2 }'`

   #remove the URL tag
   SVNROOT=`echo $SVNROOT | awk -F"//" '{ print $2 }'`

   #retrieve the project key
```







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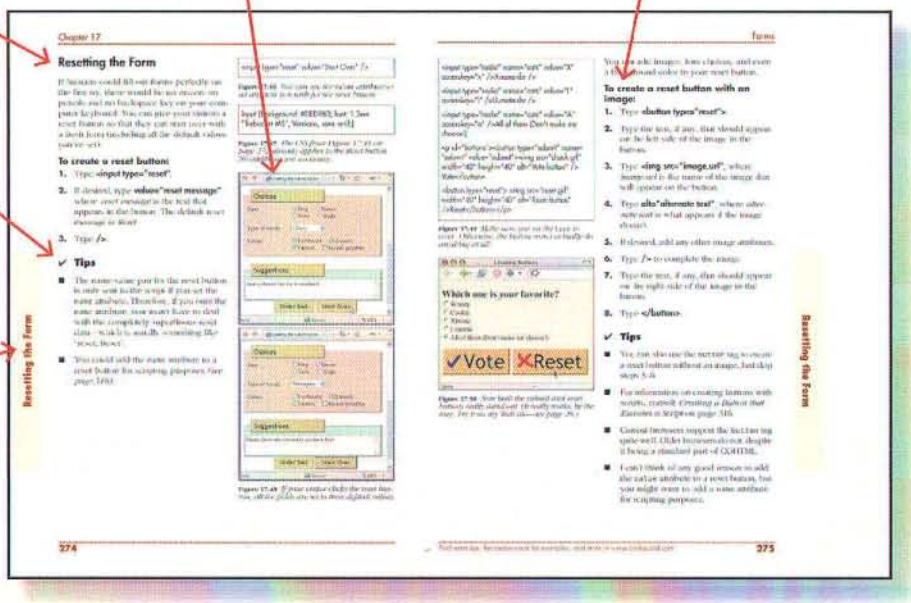

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www.peachpit.com/namethebunny

```
SVNGREP=`grep $SVNURL .svn/entries`

#retrieve the project name
SVNPROJ=`echo $SVNGREP | awk -F= '{ print $2 }'`
SVNPROJ=`echo $SVNPROJ | awk -F"\"" '{ print $2 }'`
SVNPROJ=`echo $SVNPROJ | awk -F"/" '{ NOM=NF-1 ; print $NOM }'`

#check for the following directory
if [ ! -d $SVNDIR ];
then
   mkdir -p $SVNDIR
fi

#retrieve the repository key structure
svnlook tree $SVNROOT $SVNPROJ —show-ids 1> $SVNLOG 2>
$SVNERR
if [ ! -s $SVNERR ];
then
   rm -Rf $SVNERR
fi

#construct the full path to the log file
SVNLOG=`pwd`/$SVNLOG
SVNLOG="OS X"`echo $SVNLOG`
SVNLOG=`echo ${SVNLOG//\//:}`
SVNLOG="\"$SVNLOG\""

#open the file using XCode
osascript <<-APPLESCRIPT
   tell application "Finder"
      set fileref to get file $SVNLOG as string

      tell application "XCode"
        activate
        open file fileref
      end tell
    end tell
   APPLESCRIPT
else
   echo "This project is currently not under SCM by Subversion."
fi
```

A second example of a Subversion menu script is shown in Listing 3. This script also performs the same checks as the previous one. Afterwards, it queries the user for a backup filename and a location where to store the backup. It then invokes the `svnadmin dump` subcommand to create the backup file at the specified location. A variation of this script is also used to invoke the `svnadmin hotcopy` subcommand.

Listing 3. Creating a repository backup file.

```
#! /bin/bash
#
# Script:    svnadmin_dump.sh
# Description: Create a backup image of the SVN repository.
#
# - PB User Script Info -
# %%%{PBXName=Create Backup Image}%%%
# %%%{PBXInput=None}%%%
# %%%{PBXOutput=SeparateWindow}%%%
#
# update the following environmental variable
export PATH=/usr/local/bin:/usr/local/lib:$PATH

#prepare the following shell variables
SVNTAG="repos="   #the repository tag
SVNURL="url="     #the URL tag

SVNOUT=svn`date "+%m%d%y%H%M%S"`.bak  #default output file
SVNMSG="Save the file in:"          #output prompt

#check for the following hidden directory
if [ -d ".svn" ];
then
  #prompt the user for the output path

SVNBAK=`%%%{PBXUtilityScriptsPath}%%%/AskUserForNewFileDialog
"$SVNMSG" "$SVNOUT"`

  #validate the output path
  SVNCNT=`echo $SVNBAK | awk -F"/" '{ print NF }'`
  if [ "$SVNCNT" -gt "1" ];
  then
    #start the backup process
    #——
    #retrieve the repository key
    SVNGREP=`grep $SVNTAG .svn/entries`

    #retrieve the repository location
    SVNROOT=`echo $SVNGREP | awk -F= '{ print $2 }'`
    SVNROOT=`echo $SVNROOT | awk -F"\"" '{ print $2 }'`

    #remove the URL tag
    SVNROOT=`echo $SVNROOT | awk -F"//" '{ print $2 }'`

    #invoke the svnadmin command
    svnadmin dump $SVNROOT -q > $SVNBAK
  fi
else
  echo "This project is currently not under SCM by
Subversion."
fi
```

Menu scripts, however, do have some inherent problems. Since the Script menu is enabled only when

XCode is displaying a project, it makes it unfeasible to create a menu script that will invoke an `svn checkout` transaction. Also, if a menu script contains a call to one of its built-in utility scripts, specifically those that displays a user-interface, and to the `osascript` tool as well, XCode hangs consistently whenever it rebuilds its Script menu. Separating those two calls is the only way of avoiding the hang condition.

Concluding Remarks

Subversion is a source-code management system that improves upon the venerable CVS in numerous ways. It supports most of the same subcommands while providing more relevant ones to do other transactions. It also supports binary file formats, provides better handling of project subdirectories, and has backup and restore features.

The XCode development environment integrates rather well with Subversion. Since both uses nearly the same subcommands, XCode was able to use Subversion without any major issues. More advanced Subversion features can be accessed through XCode by providing the appropriate menu scripts.

[Ed. Note - As shown, Subversion is an incredible tool. But note that it's not only for source code! Mac techs will be seeing a lot more Subversion in their future. Also, while the underlying principals are important to understand, if you ever need a quick-and-dirty svn check out, or are just pre-disposed to the GUI, a new graphical Subversion client just *shipped for the Mac. ZigZig Software introduced ZigVersion during WWDC 2006 - after José wrote this article! Find out more at http://www.zigzig.com]*

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About The Author

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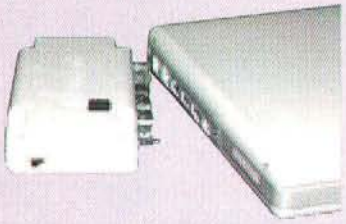

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A Look at Apple's Xsan

By Paul T. Ammann

What Is Xsan? An Introduction

Xsan is Apple's high-performance SAN file system for Mac OS X and Mac OS X Server.

Xsan enables you to share one or more Xserve RAID devices with multiple XServe or Mac systems. With the Xsan file system installed, these computers can read and write to the same storage volume at the same time. Xsan includes all the software required for a complete SAN solution including the metadata controller software, the file system client software and integrated setup, management and monitoring tools.

Xsan may be used in a cross-platform environment alongside Windows-, UNIX-, and Linux-based systems using the ADIC StorNext File System, which is 100% interoperable with Xsan.

As of May 2006, Xsan supports volume sizes nearly 2 petabyte in size.

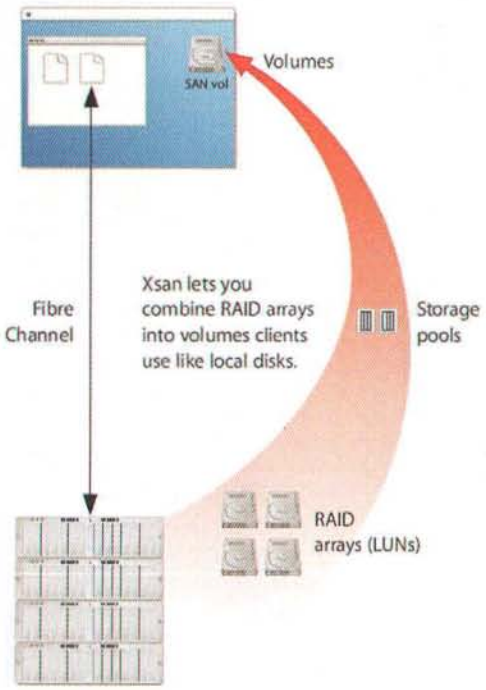

Figure 1

Xsan Storage Area Networks

A storage area network is a way of connecting computers to storage devices that gives users a very fast access to files and gives administrators the ability to expand storage capacity as needed without interrupting users.

An Xsan SAN consists of:

* Volumes of shared storage, stored on Xserve RAID systems, available to clients as mounted volumes that they can use like local disks
* At least one computer acting as a metadata controller that coordinates access to the shared volumes
* Client computers that access storage in accordance with established permissions and quotas
* Underlying Fibre Channel and Ethernet networks.

The following illustration shows the physical components of a typical Xsan SAN.

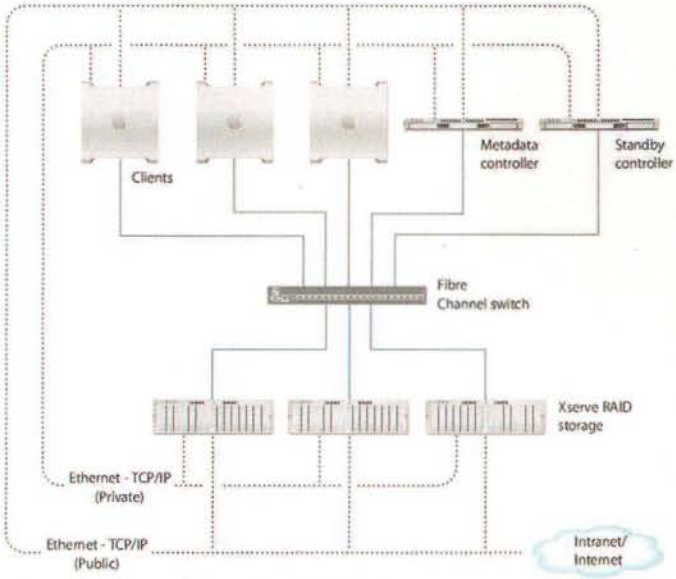

Figure 2

Shared SAN Volumes

Users and applications see shared SAN storage as local volumes. Xsan volumes are logical disks made up of groups of RAID arrays. The elements you combine to create an Xsan volume are described under "How Xsan Storage Is Organized" later in this article.

Controllers and Clients

When you add a computer to an Xsan SAN, you specify whether it will play the role of client, controller, or both.

Controllers

When you set up an Xsan SAN, you assign at least one computer to act as the controller. The controller manages the SAN volume metadata, maintains a file system journal, and controls concurrent access to files. Metadata includes such information as where files are actually stored and what portions of available storage are allocated to new files.

For high availability, you can add more than one controller to a SAN, as shown in Figure 2. If the primary controller fails, the standby controller takes over. Controllers can also act as clients, so you can use a standby controller as a working client while the primary controller is operational.

Clients

The computers that users or applications use to access SAN volumes are called clients. Clients communicate with controllers over the Ethernet network but use Fibre Channel to send and retrieve file data to and from the RAID systems that provide storage for the volumes.

SAN Connections

Xsan uses independent networks to connect storage devices, metadata controllers, and client computers: a Fibre Channel network and one or two Ethernet networks.

User Data Over Fibre Channel

User data is transferred over high-speed Fibre Channel connections. Controllers also use a Fibre Channel connection to move metadata to and from the volume.

Metadata Over Ethernet

To eliminate unnecessary traffic on the Fibre Channel connections, controllers and clients use an Ethernet network to exchange file system metadata. (When a controller reads or writes metadata on a volume, it uses Fibre Channel.) The Xsan Admin application also uses the Ethernet connection to let you manage the SAN.

To prevent Internet or intranet traffic from interfering with metadata communications, you can set up separate Ethernet networks as shown in the illustration.

Fibre Channel Multipathing

Xsan can take advantage of multiple Fibre Channel connections between clients and storage. Xsan can alternate between connections for each read and write, or assign each LUN in a volume to one of the connections when the volume is mounted.

How Xsan Storage Is Organized

Users use an Xsan volume the same way they use a logical disk. What they don't see is that the SAN volume actually consists of numerous physical disks combined on several levels using RAID techniques.

The following illustration shows an example of how disk space provided by the individual drive modules in Xserve RAID systems is combined into a volume that users see as a large local disk.

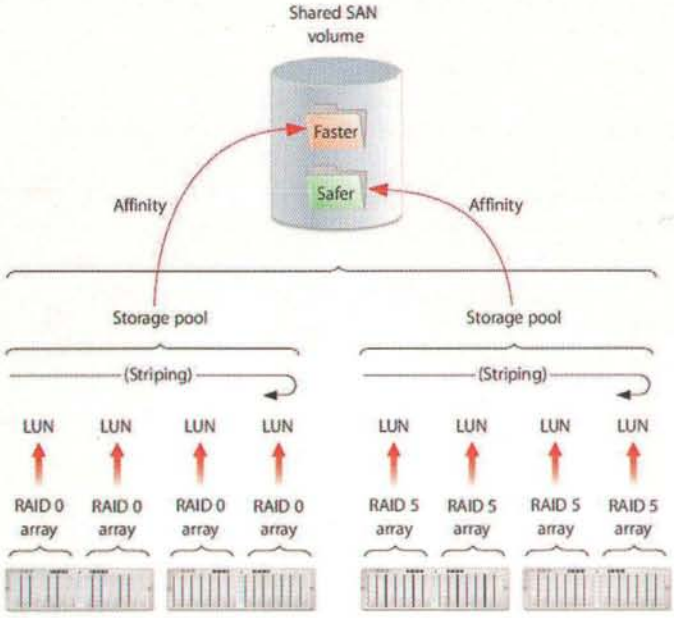

Figure 3

The following paragraphs describe these storage elements and how you organize them to create shared Xsan voumes.

LUNs (RAID Arrays)

The smallest storage element you work with in Xsan is a logical storage device called a LUN (a SCSI logical unit number). In most storage area networks a LUN represents a group of drives such as a RAID array or a JBOD (just a bunch of disks) device. In Xsan, LUNs are Xserve RAID arrays or slices.

You can create a LUN when you use RAID Admin to create an Xserve RAID array. The controller hardware and software in the Xserve RAID system combine individual drive modules into an array based on the RAID scheme you choose. Each array appears on the network as a separate LUN. If you slice an array, each slice appears as a LUN.

One of your first tasks when you set up a SAN volume is to prepare LUNs. If the two RAID 5 arrays on a new Xserve RAID are not right for your application, you can use RAID Admin to create arrays based on other RAID schemes.

Figure 3 shows four Xserve RAID systems hosting two arrays each. Half of the arrays use a RAID 0 scheme (striping only) for speed while the others use RAID 5 (distributed parity) to ensure against data loss. Xsan sees the arrays as LUNs that can be combined to create a volume.

After your Xserve RAID LUNs are set up, you label and initialize them for use with the Xsan file system using Xsan Admin.

Storage Pools

LUNs are combined to form storage pools. A storage pool in a small volume might consist of a single RAID array, but storage pools in many volumes consist of multiple arrays.

Xsan distributes file data in parallel across the LUNs in a storage pool using a RAID 0 (striping) scheme. So, you can improve a client's access speed by distributing available storage over several LUNs in a storage pool

You can set up storage pools that have different performance or recoverability characteristics and assign folders to them using affinities. Users can then select where to store files based on their need for speed or safety. More information about this will be covered in "Folders with Affinities."

As an example, Figure 3 shows eight LUNs combined into two storage pools, one pool consisting of RAID 0 (fast but not recoverable) arrays and the other made up of RAID 5 (not as fast, but recoverable) arrays, Xsan stripes data across the four LUNs in each storage pool.

You use Xsan Admin to add available LUNs to specific storage pools.

Volumes

Storage pools are combined to create the volumes that users see. From the user's perspective, the SAN volume looks and behaves just like a large local disk, except that:

* The size of the volume can grow as you add underlying arrays or storage pools
* Other users on the SAN can access file on the volume at the same time

In the example illustrated in Figure 3, two storage pools are combined to create a single shared volume.

You create volumes and mount them on client computers using the Xsan Admin application.

The following screen image shows how LUNs, storage pools, and volumes appear as you organize them in the Xsan Admin application. This example shows a SAN named "Editing SAN" with a single shared volume named "SanVol." Storage for the volume is provided by two storage pools, "Meta" and "Data," the first based on a single LUN and the second on two. Each of the LUNs is a 3-disk RAID 5 array on an Xserve RAID using 115 GB drive modules.

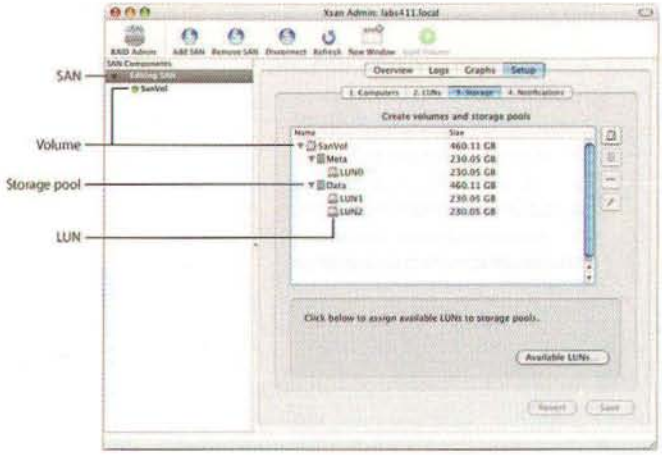

Figure 4

Folders with Affinities

To control which storage pool is used to store specific files (for example, to provide different levels of service for different users or applications), you can associate a folder on an Xsan volume with one of the storage pools that make up the volume.

If, for example, you set up storage pools with different balances of performance and data redundancy, users can choose between faster and safer storage by putting files in the appropriate folder.

In Figure 3, a predefined folder has an affinity for the faster storage pool that is based on RAID 0 arrays. Any file that a user copies into this folder is automatically stored on the faster arrays. A second folder is associated with the more secure RAID 5 storage.

How Xsan Utilizes Available Storage

Xsan stores both user files and file system data on SAN volumes, and stripes data across the LUNs in a volume for better performance.

Metadata and Journal Data

Xsan records information about the files in an Xsan volume using metadata files and file system journals. File system metadata includes information such as which specific

parts of which disks are used to store a particular file and whether the file is being accessed. The journal data includes a record of file system transactions that can help ensure the integrity of files in the event of a failure.

These files are managed by the Xsan metadata controller, but are stored on SAN volumes, not on the controller itself. By default, metadata and journal data are stored on the first storage pool you add to a volume. You can use Xsan Admin to choose where these files are stored when you add storage pools to a new volume.

Striping at a Higher Level

When you write a file to a RAID array using RAID 0 (striping), the file is broken into segments that are spread across the individual disk drives in the array. This improves performance by writing pieces of the file in parallel (instead of one piece at a time) to the individual disk in the array. Xsan applies this same technique at a second, higher level in the storage hierarchy. Within each storage pool in a volume, Xsan stripes file data across the individual LUNs that make up the storage pool. Once again, performance is improved because data is written in parallel.

You can tune SAN performance by adjusting the amount of data written to each LUN in a storage pool (the "stripe breadth") to suit a critical application.

Security

As a SAN administrator, you can control access to shared volumes in several ways.

First, users cannot browse or mount SAN volumes. Only a SAN administrator can specify which volumes are mounted on which client computers. One way you can control access to data is to mount a volume only on appropriate client computers.

To prevent users from modifying data on a volume, you can mount the volume with read-only access.

You can also control user access to folders on a volume by specifying owner, group, and general access permissions as you would in the Finder.

You can also set up zones in the underlying Fibre Channel network to segregate users and volumes.

Expanding Storage

There are two ways you can add free space to an Xsan volume:

* Add Xserve RAID systems (new LUNs) to existing storage pools
* Add entire new storage pools to volumes

Both methods require you to unmount and remount the volume on clients.

You can also add new volumes to a SAN at any time.

Xsan Capacities

The following table lists limits and capacities for Xsan volumes.

Table 1

Parameter	Maximum
Number of computers in a SAN (controllers and clients)	64
Number of storage pools in a volume	512
Number of LUNs in a storage pool	32
Number of LUNs in a volume	512
Number of files in a volume	4,294,967,296
LUN size	2 TB
Volume size	16 TB (Mac OS X v10.3) 1024 TB (Mac OS X v10.4)
File size	16 TB (Mac OS X v10.3) 1024 TB (Mac OS X v10.4)
Volume name length	70 characters
File or folder name length	251 characters
SAN name length	255 characters
Storage pool name length	255 characters
LUN name (label or disk name)	242 characters

Summary

I hope this article presented a good overview of Apple's Xsan and storage area networks. In a future article, I will discuss how to set up a storage area network using Xsan.

About The Author

Paul T. Ammann has been working in IT for almost 20 years now. He is happily married to his wife Eve for 7 years, residing in New Fairfield, CT. He finds writing the author's bio the toughest part the article.

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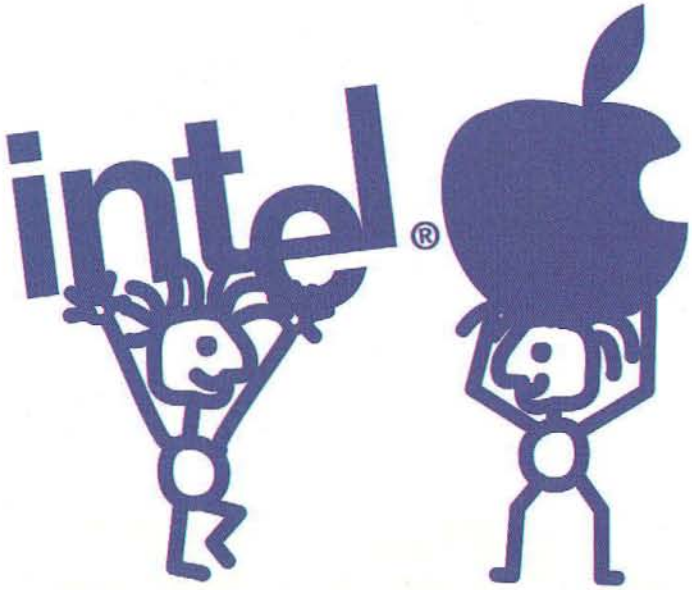

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